Redemption in Kind and Mutual Fund Liquidity Management

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December 2021

Open-end mutual funds can use redemption in kind to satisfy investor redemptions by delivering securities instead of cash. We find that funds that reserve their rights to redeem in kind experience less redemption after poor performance. Evidence from actual in-kind transactions reveals several unique mechanisms for redemption in kind to mitigate fund runs, including the delivery of more illiquid stocks and stocks with greater tax overhang. Funds also suffer less from the adverse impact of outflows on their performance. On the other hand, redeeming investors bear significant liquidation costs when they are forced to sell securities on their own.

JEL classification: G23, G28

Keywords: redemption in kind, mutual funds, liquidity management, financial fragility

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1. Introduction

Open-end investment funds typically invest in illiquid assets while offering more generous liquidity terms to their investors. However, large investor redemptions can exacerbate liquidity mismatch and generate severe consequences such as strategic complementarities or run-like behavior (Chen, Goldstein, and Jiang, 2010; Goldstein, Jiang, and Ng, 2017) as well as adverse effects on asset prices (Coval and Stafford, 2007) and fund performance (Edelen, 1999). In this paper, we investigate redemption in kind (hereafter RIK) as a liquidity management tool that has received growing attention from regulators and practitioners.[1] RIK allows fund managers to deliver a portfolio of securities in lieu of cash to redeeming investors. Is RIK effective in reducing investor runs and associated financial fragility through the suspension of funds' liquidity transformation services? What are the implications of RIK for fund performance, redeeming and non-redeeming investors, and financial stability in general? We attempt to answer these questions in this study.

There are several unique channels for RIK to discourage investor redemption and mitigate run-like behavior that are distinctive from other liquidity management tools. First, through the delivery of securities in lieu of cash, funds pass the transaction costs associated with security sales to redeeming investors. Remaining fund investors therefore have less incentive to withdraw strategically because they are less subject to the costs from asset sales. Second, funds have discretion in selecting the securities to deliver via RIK.[2] For example, funds can deliver relatively illiquid securities with substantial selling costs to redeeming investors. Consequently, RIK should help discourage redemption and, in turn, alleviate strategic complementarities among investors.

[1] SEC Release No. 33-10233, Sec. III.F available at https://www.sec.gov/rules/final/2016/33-10233.pdf.
[2] Funds may choose whether or not to deliver securities on a pro rata basis. We provide detailed discussions of the institutional background in Section 2.

Third, facing investor redemption, fund managers may be forced to sell securities with built-in capital gains and by law must distribute such gains to the remaining investors (Dickson, Shoven, and Sialm, 2000; Bergstresser and Poterba, 2002). Such a negative tax externality can further amplify strategic complementarities and financial fragility (Sialm and Zhang, 2019). However, under the tax law, when managers deliver securities with built-in capital gains through RIK, funds do not recognize or distribute any gains for tax purposes. RIK mitigates adverse tax consequences for non-redeeming investors to encourage them to stay invested in the fund.

To the best of our knowledge, there is little empirical evidence on the extent to which funds utilize RIK as a liquidity management tool, and its efficacy for funds and investors. We fill this gap in the literature by conducting the first study of RIK for which we manually collect comprehensive data in mutual fund prospectuses and Form N-18F-1 filings. We identify all U.S. domestic equity funds that reserve the right to use RIK (hereafter RIK funds) from 1997 to 2017. We observe a significant increase in the proportion of RIK funds over our sample period: 27.9% of the sample funds start as RIK funds, 41.8% switch to RIK funds over time, and the remaining 30.3% stay as non-RIK funds. We find that funds following illiquid investment styles are more likely to reserve RIK. Moreover, we observe weak correlations between RIK and other liquidity management tools such as cash holdings and borrowing, consistent with the distinctive benefits of RIK such as mitigating liquidation costs and negative tax externalities for non-redeeming investors.

Next, we examine whether RIK mitigates investor runs and associated capital fragility. Following the literature, we use the sensitivity of investor flows to poor past performance to capture run-like behavior.[3] We find that the sensitivity of flows to poor performance reduces significantly when funds reserve RIK. A battery of robustness tests helps strengthen our

[3] See, e.g., Chen, Goldstein, and Jiang (2010), Goldstein, Jiang, and Ng (2017), Agarwal and Zhao (2019), Franzoni and Giannetti (2019), Aragon, Nanda, and Zhao (2020), and Jin et al. (2020).

identification, including (i) matching RIK funds with non-RIK funds on observable fund characteristics, (ii) exploiting shocks to investor redemptions during market distress; (iii) controlling for the clientele effect by separately examining retail and institutional investors; (iv) focusing on a subsample of funds switching from non-RIK to RIK; and (v) investigating illiquid equity funds and bond mutual funds.

To understand the extent and magnitude of RIK usage, we manually collect data on actual RIK transactions from funds' shareholder reports. 13.1% of the funds that reserve RIK actually engaged in in-kind redemptions at least once during our sample period.[4] Moreover, the disclosed RIK transaction amounts are economically large. The mean and median dollar amounts are $153 million and $70 million. The mean and median percentage amounts (when scaled by the assets under management) are 10% and 4%, respectively. These figures are much larger compared with those for other liquidity management tools such as cash holding (mean: 3.37%, median: 1.98%) and interfund lending (mean: 3.11%, median: 0.90% in Agarwal and Zhao, 2019). We also find that funds use in-kind redemptions when they have emergency liquidity needs after large outflows.

We next document several novel findings that shed light on the channels through which RIK mitigates fund runs. First, we examine changes in portfolio holdings of funds that experience investor outflows. Consistent with Lou (2012), the changes are non-proportional, with greater declines in funds' more liquid holdings, i.e., funds first sell liquid holdings to meet investor redemptions. In contrast, during events of RIK utilization, we observe disproportionally larger declines in funds' more illiquid holdings, suggesting that they deliver illiquid securities to redeeming investors. Since remaining investors are left with a relatively liquid portfolio, they

[4] The extent of RIK usage we document is a lower bound of the actual figure because there is no regulatory requirement for funds to disclose their RIK activities during our sample period.

should be more likely to stay invested due to less liquidation costs and strategic complementarities (Chen, Goldstein, and Jiang, 2010). Interestingly, we do not find that funds deliver securities with ex-ante poor performance (i.e., abnormal short interest), suggesting that getting rid of "lemons" is not a channel through which RIK mitigates runs. Second, we examine if RIK funds fully or partially offload illiquid securities in RIK transactions. If redeeming investors rush to sell securities received in RIK transactions, the price pressure may adversely affect remaining investors if funds continue to hold a significant portion of securities delivered in RIK. We find that funds anticipate the selling pressure from redeeming investors and are more likely to completely sell or largely offload illiquid securities delivered in RIK transactions.

Third, we find that funds use RIK to mitigate the negative tax externalities from investor redemptions. Specifically, during the events of RIK utilization, we observe disproportionally larger reductions in securities with more built-in capital gains, which we estimate based on Jin (2006). This is in sharp contrast to funds' trading behavior in the absence of RIK, where capital gains overhang reduces their propensity to sell securities (Jin, 2006). Consequently, remaining investors should be more likely to stay invested because RIK reduces fund's tax overhang and investors' strategic redemption motives to avoid capital gains distribution.

Fourth, at the stock level, we find that stocks sold due to extreme investor outflows undergo greater price pressure after RIK transactions. This suggests that redeeming investors bear higher selling costs compared with fund managers, possibly because funds can lower transaction costs through economies of scale and longstanding relation with brokers. Such costs should further discourage investor redemptions. Finally, at the fund level, we find that RIK utilization alleviates the adverse impact of large outflows on fund performance, which again attenuates run-like behavior.

Recent literature highlights the importance of financial fragility in open-end mutual funds, and more broadly, in the shadow banking system.[5] Recognizing the economic implications of fragility on financial stability, a growing literature examines how funds can alleviate fragility.[6] We contribute to this literature by providing the first systematic study of RIK in the mutual fund industry to show that RIK is an effective liquidity management tool that mitigates financial fragility albeit through distinctive channels compared with other tools. Investors enjoy several benefits from investing in RIK funds, including less strategic redemption, significant tax advantage, and better fund performance after large redemptions. However, the tradeoff is that investors may receive illiquid securities exactly when they need liquidity, and bear higher costs of selling illiquid stocks on their own.

Our study also has several policy implications. During the recent regulatory reforms of open-end investment funds, RIK received a lot of attention from the Securities and Exchange Commission (SEC) as a potentially important and effective liquidity management tool (Release No. 33-10233, Sec. III.F). We find that given the threat of receiving in-kind securities, RIK reduces strategic investor redemption after poor performance, contributing towards improving financial stability. On the other hand, when redeeming investors receive in-kind redemptions, there is greater price pressure on the in-kind securities received and sold by redeeming investors, thus threatening financial stability because these securities may be held by many other market participants who would have to bear the adverse consequences of fire sales.

[5] Specifically, fragility has been documented for equity mutual funds (Chen, Goldstein, and Jiang, 2010), bond mutual funds (Goldstein, Jiang, and Ng, 2017; Chen and Qin, 2017), and money market funds (Kacperczyk and Schnabl, 2013; Schmidt, Timmermann, and Wermers 2016). Even hedge funds that have more discretion in dealing with investor redemptions (Aiken, Clifford, and Ellis, 2015) can experience fragility (Agarwal, Aragon, and Shi, 2019; Aragon, Nanda, and Zhao, 2020).

[6] Funds can manage liquidity with cash holdings (Chernenko and Sunderam, 2016; Zeng, 2017), interfund lending (Agarwal and Zhao, 2019), financial conglomerate affiliation (Franzoni and Giannetti, 2019), and swing pricing (Lewrick and Schanz, 2017; Jin et al., 2020).

2. Institutional background

Laws governing the use of RIK

Mutual funds are legally entitled to reserve their rights to redeem in kind based on the regulatory requirements. Section 2(a)(32) of the 1940 Act defines "redeemable security" as a security whose holder is entitled to receive approximately his/her proportionate share of the issuer's current net assets, or the cash equivalent thereof and this provision "has traditionally been interpreted as giving the issuer the option of redeeming its securities in cash or in kind" (SEC Release No. 6401). Practitioners note that redemption in kind is "perfectly legitimate"[7] and "the Investment Company Act generally gives the decision whether to redeem in cash or in kind to the management of the fund".[8]

Mutual funds may reserve their rights to redeem in kind by filing Form N-18F-1 to the SEC. By filing this form, a fund reserves the right to deliver a selection of securities at its discretion for redemption amounts over $250,000 or 1% of the net asset value (NAV) during any 90-day period (although for small redemptions less than $250,000, the fund commits to pay cash). These redemption thresholds apply to each investor redemption, rather than the aggregate amount of redemption from all investors during the 90-day period (17 C.F.R. § 270.18f-1(a)). Although one can still avoid triggering RIK by redeeming, e.g., $250K on day 1 and $250K on day 91, RIK would still significantly alleviate funding liquidity issues compared with the situation without RIK where investors can redeem in cash as much as they wish over a relatively shorter period.

From a client relationship management perspective, fund managers may seek investor agreement before utilizing RIK to avoid disenfranchising investors. However, since legally fund

[7] See https://www.wsj.com/articles/clients-pull-cash-from-valeant-investor-get-stock-instead-1460131047.
[8] See https://www.sec.gov/divisions/investment/noaction/1999/signaturefinancial122899.pdf.

managers have significant discretion on whether and how to use in-kind redemptions as mentioned above, managers may still choose to utilize RIK without consulting with shareholders if they face emergency liquidity needs. For example, T. Rowe Price Blue Chip Growth Portfolio mentions in its prospectus that "Large redemptions (for example, $250,000 or more) can adversely affect a portfolio manager's ability to implement a fund's investment strategy by causing the premature sale of securities that would otherwise be held longer. Therefore, the fund reserves the right (*without prior notice*) to redeem in-kind".[9] Moreover, RIK transactions benefit the remaining (i.e., non-redeeming) shareholders since they pay less tax on capital gain distributions and enjoy better fund performance. Therefore, redeeming investors may voluntarily agree to RIK transactions if they still have a substantial amount invested in the fund after redeeming.

Securities delivered under RIK

Funds do not necessarily have to deliver pro rata shares to investors when utilizing in-kind redemptions. For example, several funds disclose explicitly that securities delivered via RIK will be selected at the sole discretion of the funds and will not necessarily be representative of their entire portfolios.[10] The SEC recently mandated mutual funds to establish policies and procedures regarding how they select securities for in-kind redemption, such as illiquid or restricted securities, or whether they plan to redeem only as a pro rata ratio of their holdings (Release No. 33-10233).

Tax consequences

The tax consequences for redeeming investors are the same whether they receive cash or a portfolio of securities. However, funds do not recognize or distribute any gains or losses when

[9] See https://doc.morningstar.com/docdetail.aspx?clientid=cuna&key=21d881d9a676ad8e&documenttype=124 &invest menttype=1&sourceid=208&investmentid=FVUSA002IB.

[10] For example, see the disclosure documents of several funds from Third Avenue (https://thirdave.com/wp-content/uploads/2018/08/2018-TAM-Prospectus-revised-8.29.18.pdf), Mutual Fund Series Trust (https://www.sec.gov/Archives/edgar/data/1355064/000116204413000581/catalystemp497201305.htm), Brown Advisory (https://www.brownadvisory.com/sites/default/files/Brown_Advisory_Statutory_Prospectus_8.pdf), and Bragg Capital (https://www.sec.gov/Archives/edgar/data/1170611/000116204406000496/queens497200609.htm).

redeeming in kind, i.e., there are no tax consequences for remaining (i.e., non-redeeming) investors. This is because USC §852(b)(6) exempts registered investment companies from capital gain recognition for in-kind redemptions. This scenario is different from redemption in cash, where any built-in capital gain is immediately recognized and borne by the remaining shareholders since the gain is considered "distributed" to the remaining shareholders even if it is actually reinvested into the fund (Dickson, Shoven, and Sialm, 2000; Bergstresser and Poterba, 2002; Colon, 2017). In other words, remaining shareholders can avoid (immediate) recognition of taxable gains when funds utilize in-kind redemptions. It is true that this part of capital gain is reclassified as paid-in capital and is reflected in the appreciation of the fund's NAV. Essentially, investors remaining in the fund defer capital gain taxes until they eventually sell their fund shares. However, benefits of tax deferral can be substantial. For example, investors can indefinitely defer and avoid paying capital gain taxes as long as they stay invested. In Appendix A, we provide a numerical example to illustrate the tax consequences of cash and in-kind redemptions for both redeeming and non-redeeming investors when securities have unrealized capital gains.

If distributed securities have unrealized losses, according to USC §311(a) no loss is immediately recognized at the fund level regardless of whether redemption is in cash or in kind. Note that this is different from the case of distributing securities with unrealized capital gains where gains are immediately recognized for cash redemption but not for in-kind redemption as mentioned earlier. This asymmetry in the recognition of unrealized capital gains versus losses provides incentive for the fund to engage in RIK for securities with unrealized capital gains.

3. Hypothesis

We hypothesize that RIK should discourage investor redemption and mitigate run-like behavior for several reasons. First, mutual funds typically deliver cash to redeeming investors. As

illustrated by Chen, Goldstein, and Jiang (2010), this creates a first-mover advantage, since those who redeem first bear little transaction costs from asset sales. The reason is that, redemption costs are usually not reflected in redemption prices because NAVs for redeeming investors are calculated at 4:00 p.m. on the day of redemption, while actual trading generally takes place after the redemption day due to institutional frictions. When funds use RIK to deliver a portfolio of securities, the first-mover advantage is significantly reduced because redeeming investors now bear the transaction cost of selling the securities themselves.

Second, if funds selectively deliver relatively illiquid securities in RIK transactions, it should further mitigate strategic complementarities. This is because redeeming investors would have less incentive to redeem in the first place, since the cost to sell illiquid securities is greater. In addition, remaining investors are also more likely to stay invested because they do not bear the cost of funds selling illiquid securities in the secondary market.

Finally, compared with cash redemption, in-kind redemption creates tax advantages for investors that stay in the fund as they can defer capital gain taxes until it is optimal for them to redeem, a notion similar to tax-timing strategies (Stiglitz, 1983; Constantinides, 1984; Dammon and Spatt, 1996). This would also predict that RIK mitigates run-like behavior.

Overall, by investing in a RIK fund, investors may receive illiquid securities exactly when they need liquidity. Offsetting this potential cost, investors enjoy several benefits of investing in RIK funds, including less strategic complementarity and significant tax advantage. From the investors' point of view, the tradeoff is between the above benefits while they stay invested, and the risk of receiving illiquid securities if they do make large redemptions. From the fund's perspective, the tradeoff associated with the RIK is that funds benefit from less run behavior and

greater net outflows during bad times, but may bear the cost in terms of lower net inflows during good times since RIK potentially disenfranchises flows from investors capable of triggering RIK.

4. Data and variable construction

4.1 Mutual fund data

We select our equity fund sample from the CRSP Survivorship-Bias-Free Mutual Fund Database from 1997 to 2017. Following the literature, we classify mutual funds as actively managed U.S. domestic equity funds based on the Strategic Insight objectives, Wiesenberger Fund Type Codes and CRSP objective codes. Specifically, we include funds with the following Strategic Insight objectives: AGG, GMC, GRI, GRO, ING, or SCG. If a fund does not have a Strategic Insight objective, we use the Wiesenberger Fund Type Code and pick funds with the following objectives: G, GCI, LTG, MCG, and SCG. If none of these objectives are available and the fund has the first three letters of CRSP objective codes as EDC or EDY, then the fund will be included. We exclude funds with CRSP index fund flag equal to "D" (pure index fund) or "E" (enhanced index fund). We also exclude funds with CRSP ETF flag equal to "F" (ETF) or "N" (ETN). Finally, we exclude funds whose names may indicate they are index funds or ETFs.

Our sample starts from 1997 because prior to 1993, filings of fund disclosure documents are not electronically available on the SEC EDGAR, and from 1993 to 1996, electronic filing requirements were implemented in different stages and not all funds were required to file electronically (Gao and Huang, 2020). We aggregate reported variables across share classes at the fund level by value weighting them based on the total net assets (TNA) of each share class, and exclude funds with TNA less than $5 million to mitigate the effect of outliers when calculating percentage flows. Our final sample includes 3,994 unique funds from 1997 to 2017 with 125,588 fund-quarter observations.

We estimate quarterly fund flows as the three-month net flows for each fund using its quarterly returns and TNA at the beginning and end of each quarter as follows:

$$flow_{i,[t-3,t]} = \frac{TNA_{i,t} - TNA_{i,t-3}(1+Ret_{i,[t-3,t]})}{TNA_{i,t-3}} \quad (1)$$

where *t* denotes the month and *i* denotes the fund.

Our performance measures include return, style-adjusted return, and three-factor alpha based on Fama and French (1993), all net of fees, and our results are robust using the Carhart (1997) four-factor model. The style-adjusted return is fund return minus the average returns for all funds belonging to the same investment style during a given quarter. The three-factor alpha is calculated out-of-sample each month using factor loadings estimated from the past two years of monthly fund returns. Quarterly alpha is obtained by compounding monthly alphas.

Following Chen, Goldstein, and Jiang (2010), we create a dummy variable *illiquid* to indicate funds with illiquid investment styles. Specifically, *illiquid* equals one if a fund's CRSP Standard & Poor's style codes indicate that the fund invests primarily in one of the following categories: micro-cap equities, small-cap equities, or mid-cap equities. This definition has the advantage that it is readily available to all investors, and is exogenous to fund flows because it is the stated investment objective at the fund's inception. For fund holdings, we merge the CRSP mutual fund database with the Thomson Reuters holdings database using the MFLINKS file based on Wermers (2000) and the procedure in Kacperczyk, Sialm, and Zheng (2008).

We obtain several variables from the N-SAR filings. Our measure of fund borrowing (*borrow*) is the average of four indicator variables that are set to one if a fund reports "Yes" to the following questions, and zero otherwise: Questions 55A and 55B ask whether a fund borrows in excess of 1% of its assets either through an overdraft or a bank loan; Question 70O01 asks whether borrowing is permitted by investment policies; and Question 70O02 asks whether a fund engages

in borrowing during the reporting period. We also collect responses to two questions related to capital gains from the N-SAR filings: Question 72AA reports the amount of realized capital gains, and Question 72EE reports the total capital gains distribution. We then merge the N-SAR data with CRSP using ticker symbols and fund names.

Finally, following Jin (2006), we estimate the built-in (i.e., unrealized) capital gains for each of the portfolio stocks using fund holdings data. Specifically, for funds incepted before 1997, the beginning of our sample period, we assume that securities were purchased during the first quarter of 1997. The quarter-end price of each stock is the starting tax basis for that stock. We then adjust the tax basis and compute the built-in capital gains or losses in subsequent quarters for each stock position as follows. First, the number of shares purchased or sold during a quarter is the difference between shares held at the end and the beginning of the quarter, adjusted for stock splits. Second, because we do not observe the exact dates of purchases and sales and the corresponding transaction prices, we assume all transactions take place at the end of the quarter. Third, we calculate the updated tax basis in the following quarters for each stock holding. When there is a net purchase during the quarter, the updated tax basis is the weighted average of the beginning of the quarter tax basis and the end-of-quarter closing price, weighted by the number of shares held at the quarter beginning and additional shares purchased, respectively. When there is a net sale, we assume that all purchased stocks are sold proportionally, and consequently the tax basis remains unchanged. Finally, we compute the built-in capital gains and losses using the calculated tax basis. The gains and losses are equal to the current (quarter-end) share price minus the tax basis, multiplied by the number of shares held at quarter end. Our stock-level capital gain measure, *cgstock*, is the dollar amount of capital gains scaled by the position size if the stock has built-in capital gains, and zero if the stock has built-in losses. When we aggregate the estimated stock-

level capital gains and losses at the fund level, the correlation between our fund-level measure and actual unrealized capital gains and losses reported on funds' Form N-SAR is as high as 55%, suggesting that the methodology of Jin (2006) approximates well the actual tax basis of fund holdings.

4.2 Classification of RIK funds

To identify mutual funds that reserve RIK, we first collect all Form N-18F-1 filings in the SEC EDGAR database from 1997 to 2017. This process identifies all funds that have opted for this exemption under Rule 18f-1 since year 1997. We label them as RIK funds after, but not before, they file Form N-18F-1. Second, we create a comprehensive list of keywords related to in-kind redemptions such as "redemption in kind", "in-kind redemption", and another 38 variations of keyword strings (the complete list is available upon request from the authors), and screen fund prospectuses for these keywords during our sample period. We then read these prospectuses and confirm that such funds indeed reserve their rights to redeem in kind, and label them as RIK funds. This process identifies funds that have filed Form N-18F-1 before 1997. Finally, we merge the identified RIK funds with the CRSP mutual fund data by fund tickers and names.

Table 1 reports the summary statistics of our sample. Panel A shows that among the 3,994 funds, 27.9% reserved their rights to redeem in kind at the beginning of our sample period, 41.8% switched to RIK funds between 1998 and 2017, and the remaining 30.3% were non-RIK funds.

Panel B of Table 1 report the summary statistics (Columns (1) through (5)), and compares the fund characteristics between RIK and non-RIK funds (Columns (6) through (8)), and within the subsample that switch from non-RIK to RIK, before and after RIK adoption ((Columns (9) through (11)). We find that RIK funds are older, have more assets under management, follow more illiquid investment styles, have less investor flow, and hold less cash. Among RIK-reserve funds,

we find that similar differences exist before and after RIK adoption. Most of these differences are mechanical in cases of funds switching from not having to having the RIK option, which makes RIK funds naturally older, and have more assets and less percentage flow. However, such differences may still confound our empirical results, and we account for such differences in our subsequent analyses.

5. RIK and flow-performance sensitivity

5.1 Characteristics associated with RIK

We start by examining the correlation between the RIK status and several observable fund characteristics.[11] Specifically, we estimate the following linear probability model:

$$RIK_{i,t} = \beta_1 + \beta_2 illiquid_i + controls + \varepsilon_{i,t} \quad (2)$$

where $RIK_{i,t}$ is an indicator variable that equals one if fund *i* is classified as a RIK fund during quarter *t*, and zero otherwise; *illiquid* captures whether a fund has an illiquid investment style as defined previously; and *controls* is a vector of control variables that include a host of fund characteristics (size, turnover ratio, expense ratio, age, and load fees) and time fixed effects. We cluster standard errors at the fund level.

We report estimation results of Equation (2) in Column (1) of Table 2. Not surprisingly, we find a positive and significant coefficient on *illiquid*, i.e., illiquid funds are more likely to reserve RIK to manage liquidity shocks. Being an illiquid fund increases the likelihood of reserving the option to redeem in kind by 3.9%, which is 5.8% of the unconditional probability of being a RIK fund. In Column (2), we further include a continuous proxy for liquidity of holdings (*Amihud*) and style-by-date fixed effects to examine heterogeneity in fund liquidity and RIK

[11] For robustness, we use a seemingly unrelated regression approach, where dependent variables are RIK, cash holding, borrowing, and interfund lending. Our results are similar to the estimates from the OLS regressions.

adoption within an investment objective. The fund liquidity measure *Amihud* is computed by taking the weighted average of the underlying stocks' Amihud (2002) liquidity measures in a fund's portfolio. We find that within-style variations in fund liquidity on a given date do not seem to drive a fund's decision to reserve RIK.

RIK could either substitute or complement other liquidity management tools. On one hand, funds that already rely on other tools may have a lesser need to use RIK for liquidity management purposes. On the other hand, such funds may have more demand for liquidity management, which would predict that they are more likely to use RIK along with other tools. Our estimation results show insignificant coefficients on borrowing and inconclusive result on cash holdings. Since RIK is likely to be an emergency liquidity management technique while cash holding is more likely to be used in daily fund operations (Chernenko and Sunderam, 2018), it is perhaps not surprising that these two do not show a strong correlation. We also find significantly positive coefficients on interfund lending and whether the fund charges back-end load fees, indicating a complementary association between RIK and interfund lending and load fees.

We also investigate the relation between institutional ownership (assets in institutional share classes as a fraction of a fund's total assets under management) and RIK reservation.[12] We use a continuous measure of institutional ownership in Columns (1) and (2), and a nonlinear specification using quintile indicator variables in Column (3). In all specifications, we do not find a significant relation between RIK and proportional institutional ownership. Two countervailing effects make it challenging to unambiguously predict the relation between institutional ownership and RIK. On the one hand, there may be a greater need for RIK by funds with greater institutional

[12] We classify fund share classes into retail and institutional based on the methodology in Chen, Goldstein, and Jiang (2010) and aggregate the total assets held by institutional share classes. Our results are similar if we use the updated institutional share class identifier in the CRSP Mutual Fund database, which was missing for a substantial number of funds but is now available for almost all funds.

ownership because institutional investors are more likely to trigger RIK due to their sizable investment in the fund. On the other hand, funds may be reluctant to opt for RIK to avoid alienating institutional investors and thereby risk losing significant amount of assets under management.

RIK is typically not a family-level decision, which is different from the case of interfund lending programs. For example, 35% of the fund families in our sample have both RIK and non-RIK funds in the same family, suggesting that individual funds, rather than families, choose to reserve RIK. This is in sharp contrast to interfund lending programs, where fund families apply for the program that provides access to interfund lending to all funds in the family (Agarwal and Zhao, 2019). Nonetheless, we control for family size and family fixed effects in Columns (4) and (5) in Table 2 to account for any confounding effect of fund families. Our findings are similar after these controls.[13]

To further allay concerns about identification and potential omitted variable bias, we exploit within-fund variation and use a subsample of funds that switch from non-RIK to RIK funds in Column (6) to account for unobservable fund characteristics that drive the funds' decision to switch to RIK. We continue to find a positive relation between RIK and illiquidity, interfund lending, and load fees. Taken together, findings in this section indicate that RIK funds differ from non-RIK funds in several dimensions, highlighting the importance for us to account for such differences in our analyses to follow.

5.2 RIK and investor runs

5.2.1 Baseline results

[13] The illiquidity variable turns insignificant after controlling for family fixed effects because the funds in a family rarely change investment styles.

In this section, we analyze whether RIK alleviates run-like behavior in investor redemptions. Specifically, we estimate the following regression:

$$flow_{i,t+1} = \beta_1 + \beta_2 Perf_{i,t} + \beta_3 Perf_{i,t} \times RIK_{i,t} + controls + \varepsilon_{i,t+1} \quad (3)$$

where $flow_{i,t+1}$ is the net quarterly flow for fund i during quarter $t+1$, $Perf_{i,t}$ is the lagged fund performance (returns, or style-adjusted returns, or three-factor alpha) during quarter t, and $RIK_{i,t}$ is the indicator for RIK funds. *controls* is the vector of control variables as in Equation (2). In addition, we control for the interaction between *age* and performance to account for the fact that RIK funds tend to be older as we show in Table 2, which may exhibit weaker flow-performance response compared with younger funds (Spiegel and Zhang, 2013). Time-invariant fund characteristics such as *load* and *illiquid* are omitted due to the inclusion of fund fixed effects. We control for quarter fixed effects and double-cluster the standard errors at the fund and quarter levels.

Following the prior literature on open-end funds, we use the sensitivity of investor flows to poor performance as a measure of run-like behavior. Specifically, we follow Agarwal and Zhao (2019) and allow for nonlinearity in the flow-performance sensitivity by separating the sensitivity for good (i.e., positive) and bad (i.e., negative) performance. The measure of good performance, *perfpos*, is equal to the corresponding performance measure if the performance figure is positive, and zero otherwise. Similarly, *perfneg* is equal to the performance measure if performance is negative, and zero otherwise. Column (1) of Panel A, Table 3 shows a larger coefficient on *perfpos* than that on *perfneg* (*p*-value=0.04, not tabulated). The flow-performance sensitivity is weaker on the poor performance side, reminiscent of the familiar convex flow-performance relation in equity mutual funds (Sirri and Tufano, 1998). Importantly, Column (2) shows that the interaction term between *RIK* and *perfneg* is significantly negative, while the interaction between *RIK* and *perfpos* is statistically insignificant. The sensitivity of flows to poor performance among RIK funds

decreases by 0.068, which is 41% less relative to the same sensitivity for funds without RIK (0.164). Columns (3) and (4) corroborate these findings using style-adjusted return and three-factor alpha as performance measures, where the sensitivities are reduced by 37% and 29%, respectively.

As mentioned earlier, RIK is typically not a family-level decision. Nonetheless, we control for family size in all specifications, and family fixed effects in Column (5) to account for any confounding unobservable effect of fund families. Moreover, given the importance of style-by-date fixed effects in RIK reservation as we find in Table 2, in Column (6) we control for style-by-date fixed effects in the flow regression for robustness. Finally, in Column (7) we examine the subsample of funds that switch from non-RIK to RIK funds during our sample period. We find that our results continue to hold after these robustness checks. Overall, our findings in this section suggest that RIK funds suffer less from investor runs and capital fragility issues.

Because we interact positive and negative performance with the RIK dummy and include the RIK dummy in all specifications, our specification only allows us to compare the flows between RIK and non-RIK funds conditional on positive or negative performance. When we do such an exercise using average values of positive and negative performance in Table 3, we find that non-RIK funds have higher net flows compared with their RIK peers for positive performance (considering the negative and significant coefficient on *RIK* and ignoring the insignificant coefficient on *RIK*×*perfpos*) but the opposite for negative performance (captured by the negative and significant coefficients on both *RIK* and *RIK*×*perfneg*), i.e., RIK funds experience more net inflows compared to non-RIK funds when funds perform poorly. We interpret these findings as suggestive of a tradeoff associated with the RIK provision that allows RIK funds to benefit from lower net outflows during bad times but bear the cost in terms of lower net inflows during good times compared with non-RIK funds.

5.2.2 Additional factors related to flow-performance sensitivity

In this section, we address the concern that other observable and unobservable fund characteristics may influence the flow-performance relation. First, the use of RIK may coincide with the use of other liquidity management tools, such as interfund lending as we show in Table 2. Second, fund liquidity influences the flow-performance relation (Chen, Goldstein, and Jiang, 2010; Goldstein, Jiang, and Ng, 2017). Third, RIK and non-RIK funds may have clienteles with different horizons. For example, RIK funds may be less appealing to clientele with short investment horizons since they may redeem more frequently and bear costs associated with in-kind redemptions.[14] Finally, institutional investors may be more likely to receive in-kind redemptions because of large redemption amounts, and since institution-oriented funds can also exhibit less run-like behavior (Chen, Goldstein, and Jiang, 2010), our results could be driven by clientele type.

We address these issues in several ways. First, we compute a measure of "residual RIK" by orthogonalizing RIK with respect to several variables that can affect the flow-performance sensitivity, including interfund lending, fund borrowing, cash holdings, load fees, fund liquidity, investment horizon, and institutional ownership. By construction, the residual RIK is unrelated to these variables. We report the results in Column (8) of Panel A, Table 3 and find that that the flow-performance results also hold using the residual RIK.[15]

Second, we match RIK funds with non-RIK funds on observable fund characteristics such as alternative liquidity management tools, fund liquidity, institutional ownership, and investment

[14] Since data on the identities of fund clients are not publically available, we use fund investment horizon to proxy for fund investor horizon assuming managers match the durations of their funds' assets and liabilities. Specifically, we compute fund investment horizon through the duration measure of Cremers and Pareek (2015, 2016).

[15] An advantage of orthogonalizing RIK with respect to these variables is that we can keep the model parsimonious, and avoid multi-collinearity between the interaction terms of RIK and all the other variables with fund performance.

horizon to ensure that differences in these characteristics do not drive our results. We entropy-balance match the treatment (RIK) and control (non-RIK) funds by reweighting the treatment and controls (Hainmueller, 2012; Agarwal, Vashishtha, and Venkatachalam, 2018). Appendix B discusses the advantages of entropy-balanced matching and shows that the characteristics of the matched treatment and control funds are virtually identical. Panel B of Table 3 repeats our baseline analysis in Panel A of Table 3 using a matched sample, and again shows that RIK funds experience less outflow after poor performance compared with matched non-RIK funds.

Third, we recognize the importance of clientele effects since RIK is likely to be primarily used with institutional investors. We control for institutional ownership in all of our flow regressions, orthogonalize RIK with respect to institutional ownership in the last Column of Panel A in Table 3, and match RIK and non-RIK funds on institutional ownership in Panel B of Table 3 to ensure that our results are not driven by the clientele effect. In Panel C, we split the sample into institutional and retail share classes, respectively, to further examine the role of clientele type.[16] We find that our result holds for both subsamples of retail and institutional shares, suggesting that our result is unlikely to be purely driven by the clientele effect. The effect of RIK in mitigating runs is stronger in the institutional subsample, consistent with the argument that institutions are more likely to be subject to RIK.

5.2.3 Illiquid equity funds and bond funds

If RIK alleviates investor runs, we should expect stronger effects among illiquid funds because the transaction costs from fire sales are greater among such funds. Panel D of Table 3 shows the results based on the subsamples of liquid (*illiquid*=0) and illiquid (*illiquid*=1) funds. We

[16] For each fund, we compute the institutional and retail flows by aggregating the flows from all institutional and retail share classes in a fund, respectively.

do observe that the effect of RIK in mitigating runs presents primarily among illiquid funds. This finding is consistent with our results in Table 2 that illiquid funds are more likely to reserve RIK.

Goldstein, Jiang, and Ng (2017) (hereafter GJN) document a concave flow-performance relation in corporate bond mutual funds. Since corporate bonds are on average more illiquid than publicly traded stocks, investors exhibit even greater run-like behavior after bond funds report poor performance. We construct a sample of corporate bond mutual funds, and manually collect the RIK reservation for these funds during our sample period to further shed light on the role of illiquidity. Due to better data availability on many key variables used in our analyses, we focus on equity funds in our study and report the sample selection, data collection process, and flow-performance results of corporate bonds funds in Appendix C.

We report the flow-performance results in Table A.C of the Appendix. In the first column under each performance measure (Columns (1), (4) and (7)), we verify that our results are consistent with those in GJN. We find that the estimated coefficients on *perfneg* are greater than the coefficients on *perfpos*, indicating a concave flow-performance relation among corporate bond funds. The second column under each performance measure all shows a negative coefficient on *RIK*×*perfneg*, suggesting that RIK reduces the sensitivity of outflows to poor fund performance. In the third column under each performance measure, we use the specification in GJN and construct a dummy variable *negdum* that is equal to one if the corresponding performance measure is negative, and zero otherwise. Consistent with GJN, the coefficients on *negdum*×*perf* are all significantly positive in all specifications, i.e., flows are more responsive to poor performance. Importantly, the estimated coefficients on *negdum*×*perf*×*RIK* are all negative and significant, showing that RIK mitigates investor runs after bad performance.

5.2.4 Investor awareness

For flows to be less sensitive to poor performance of RIK funds, investors should be aware of whether their funds reserve the rights to redeem in kind. Funds disclose such information in many important disclosure documents such as prospectuses, shareholder reports, and Form N-18F-1 filings. Among them, Form N-18F-1 is specifically about RIK and does not contain any other information such as fund performance or risks. In Appendix D, we examine the role of investor awareness using page views of Form N-18F-1 filings recorded in SEC EDGAR's web server log files, and indeed find that within RIK funds, those with more views of their Form N-18F-1 experience even less redemption after poor performance.

5.3 Shocks to investor redemption

Our previous analyses control for various observable fund characteristics that may confound our findings. We acknowledge that funds that resort to RIK might be fundamentally different on certain unobserved characteristic thus generating the differences in fund fragility that we observe. We address this issue in several ways. First, we control for fund fixed effects in all specifications to account for time-invariant unobservables that affect investor flows (except for Column (5) of Panel A, Table 3 where we control for family fixed effects). Second, we focus on the subsample of funds that switch from non-RIK to RIK funds in Column (7) of Panel A, Table 3 to account for the possibility that funds that switch to reserving RIK can be different from other funds in certain unobservable dimensions. In this section, we use events of market distress as shocks to investor redemption to further test that RIK mitigates runs.

Specifically, in Table 4 we examine the financial crises (as defined in Goldstein, Jiang, and Ng, 2017) in Columns (1) and (2) and market distress (identified by the VIX above the 75th percentile as in Jin et al., 2020) in Columns (3) and (4) as plausibly exogenous shocks to fund flows. In Columns (1) and (2), the *stress* dummy is equal to one during the financial crises include

the subprime mortgage crisis in the last two quarters of 2007 and the year of 2008, and the failure of a mega hedge fund, Long-Term Capital Management (LTCM) in the last quarter of 1998. In Columns (3) and (4), the *stress* dummy is equal to one during the quarters when the VIX index is above the 75th percentile.

We also compute a dummy variable *pre* to test the pre-event flows between RIK and non-RIK funds. In Columns (1) and (2), the *pre* dummy is equal to one during the four quarters before the subprime mortgage crisis, and one quarter before the failure of LTCM. Outside the financial crises periods, the high VIX periods are usually not consecutive quarters. Therefore, in Columns (3) and (4), we define the *pre* dummy to be equal to one during the one quarter before the high VIX quarter (similar to Jin et al., 2020). Finally, to ensure that our results are not driven by differences between RIK and non-RIK funds, the analyses in Table 4 are based on matched sample of RIK funds with non-RIK funds (again using entropy balance matching).

We report the results using the market stress periods in Table 4. Several findings are noteworthy. First, there is a negative and significant coefficient on *stress*, indicating that investors redeem heavily from the funds during market distress. Funds lost around 1% of investor flows per quarter depending on the specification, an economically significant amount considering that the average quarterly flow is a positive 2.5% during our sample period as shown in Table 2. Second and importantly, the coefficients on the interaction *stress*×*RIK* are positive and significant in all specifications, suggesting that RIK reduces the loss in flows during the stress periods. Third, the results hold either when we use the entire sample of funds (Columns (1) and (3)), or only the funds that switch from non-RIK to RIK during our sample period (Columns (2) and (4)). This mitigates the concern that the choice of switching is due to certain unobservable fund characteristics that simultaneously drive our results. Fourth, the coefficients on *pre*×*RIK* are in general insignificant.

This result validates the parallel trend assumption in the difference-in-differences analyses and shows that the result is not explained by the redemption patterns in RIK funds being different from non-RIK funds even before the stress periods.

Finally, we also control for family-level flows in this analysis to mitigate the concern that outflows come at the family level in Table 4. Consistent with the prior literature, we find that family-level flow is a significant driver of fund-level flows. More importantly, RIK helps retain investor flows during financial crises and market distress even after including this additional control. Overall, our results in this section show that RIK helps alleviate investor panic and mitigates fund runs after exogenous liquidity shocks.

6. Channels through which RIK mitigates fragility

Our results in the previous section show that RIK funds are less subject to investor runs. In this section, we shed light on the channels that can explain the muted sensitivity of flows to poor performance. To that end, we investigate events when funds actually use RIK to deliver securities, whether funds completely or partially liquidate securities in RIK transactions, and the characteristics of securities delivered in RIK transactions.

6.1 Data collection and summary statistics of RIK transactions

We collect funds' disclosures of their actual usage of RIK in the footnotes of their financial statements on Forms N-CSR and N-CSRS. Specifically, we first run a Python program to search through financial statements of all funds in our sample period and identify statements that include any keyword related to in-kind redemptions from our comprehensive keyword list. Second, we go through matched filings manually and collect data on RIK transactions such as whether securities were delivered in kind and the aggregate amount of such transactions.

We identify a total of 2,985 RIK disclosures made by 367 RIK funds in our sample period. Because there are a total of 2,783 RIK funds (=1,115+1,668 as shown in Table 1), it implies that 13.1% of the RIK funds exercised their option to redeem in kind. It is important to note that the extent of RIK usage we document is likely to be a lower bound of the actual figure because there is no regulatory requirement for funds to disclose their RIK activities during our sample period. Moreover, the percentage of funds using RIK does not capture the intensity of RIK usage because we only observe one fund disclosure at a time even if the fund delivers a significant amount in kind to multiple investors (for example, the Sequoia fund mentioned that it made thousands of in-kind redemptions[17]). Incidentally, the percentage of funds using RIK (13.1%) is comparable to the use of other liquidity management tools (7.1% for interfund lending in Agarwal and Zhao (2019) and 10% for liquidity provision from affiliated fund of funds in Bhattacharya, Lee, and Pool (2012)).

Around one third of RIK disclosures also report dollar amounts of delivered securities. The mean and median dollar amounts are economically significant at $153 million and $70 million, respectively, as reported in Panel A of Table 5. The mean and median percentage amounts when scaled by the assets under management are 10% and 4%, respectively, and are larger compared with alternative liquidity management tools such as cash holdings and interfund lending. For example, the mean and median cash holding are 3.37% and 1.98% in our sample period, while Agarwal and Zhao (2019) report mean and median interfund lending transaction amounts of 3.11% and 0.90% (all percentages of funds' assets). In Appendix E, we provide several examples of in-kind transactions from RIK disclosures.

[17] See https://www.wsj.com/articles/sequoias-redemption-with-securities-is-tax-efficient-1460583731.

Panel B of Table 5 relates fund characteristics to RIK utilization using a linear probability model. The dependent variable *useRIK* is equal to one if there is disclosure of RIK transactions by the fund during the period, and zero otherwise. Column (1) shows that investor flow is negatively related to the probability of RIK usage, i.e., funds are more likely to redeem in kind when they have less investor flow. Columns (2) and (3) show that this relation is non-linear. Investor outflows (*outflow*=1) and large investor outflows of more than 5% (*largeout*=1) both further increase the probability of RIK usage. Overall, funds are more likely to redeem in kind when they face large funding liquidity shocks, suggesting that RIK is more likely to be used in cases of emergency liquidity needs.

As discussed earlier, funds may also use RIK for tax management purposes. When funds deliver a basket of securities with built-in capital gains, gains are *realized* but not *recognized* for tax purposes (i.e., not considered "distributed"). Such gains are reclassified as paid-in capital and added to future tax liabilities of remaining shareholders (see examples in Appendix E). Consistent with funds using RIK for tax management, in Panel B we find that RIK usage is positively associated with capital gains realization (*realcapgain*). Meanwhile, realized capital gains are not distributed as indicated by an insignificant coefficient on *distcapgain*. These results support our prior findings on RIK mitigating investor runs. Since RIK allows non-redeeming investors to avoid capital gain tax distributions, it should provide them more incentives to stay invested in the fund.

6.2 In-kind redemptions and changes in funds' portfolio composition

6.2.1 Illiquid securities

Next, we examine changes in funds' portfolio composition with and without RIK utilization. Lou (2012) documents that mutual funds tend to sell liquid holdings to meet redemption

requests. However, when funds deliver securities instead of cash, they can deliver pro rata shares or deliver more illiquid securities to maintain a liquid portfolio and hedge future redemption risk. Because our sample period is more recent than Lou (2012), we first verify whether funds still tend to sell liquid positions after outflows during our sample period. We conduct a position-level analysis by examining changes in funds' equity positions over two consecutive quarter-ends in response to outflows:

$$Change_{i,j,t} = \beta_1 + \beta_2 flow_{i,t} + \beta_3 flow_{i,t} \times Amihud_{i,j,t-1} + \beta_4 flow_{i,t} \times Amihud_{i,j,t-1} \times useRIK_{i,t} + controls + \varepsilon_{i,j,t} \quad (4)$$

The dependent variable $Change_{i,j,t}$ is the percentage change in holdings of stock *j* (after adjusting for stock splits) held by fund *i* in quarter *t*. $Amihud_{i,j,t-1}$ is the Amihud (2002) illiquidity measure for stock *j*, estimated based on the stock's daily return and trading volume over the prior quarter. $useRIK_{i,t}$ is an indicator variable that is set to one if a fund discloses in-kind redemption activity during the period, and zero otherwise. As in Lou (2012), we focus on cases when funds have net outflows. Controls include fund and time fixed effects.[18]

Column (1) of Panel A, Table 6 reports our baseline results. The positive and significant coefficient on *flow* means that for each 1% outflow, funds sell 0.877% of the underlying securities. Column (2) shows a negative and significant coefficient on *flow*×*Amihud*, suggesting that for the same level of outflow, funds are less likely to sell their illiquid shares, i.e., flow-induced trading is disproportionally less for more illiquid stocks. Both results are consistent with Lou (2012). Importantly, we also observe a positive and significant coefficient on the triple interaction *flow*×*Amihud*×*useRIK*, indicating that funds experience greater declines in their illiquid securities during the periods when they utilize RIK.

[18] Our results are robust to exclusion of fund fixed effects as in Lou (2012).

Interestingly, the coefficient on the triple interaction (8.507) is significantly larger than that on the double interaction *flow×Amihud* (−3.130). If funds deliver pro rata shares to redeeming investors, we would expect to see the two coefficients to be similar in magnitude, because such funds should experience the same proportional decline in both liquid and illiquid positions. In contrast, our result suggests that when funds deliver securities in kind, they experience disproportionally larger decline in illiquid positions, most likely because they deliver illiquid securities to redeeming investors.

In Column (3), we condition the sample on large investor outflows, i.e., cases when outflows are more than 5%. The coefficient on *flow×Amihud* continues to be negative and significant, suggesting that funds sell relatively liquid securities after experiencing extreme funding liquidity shocks. Column (3) also shows an even larger coefficient estimate on *flow×Amihud×useRIK* than in Column (2), consistent with funds delivering even more illiquid stocks in RIK transactions after they face extreme funding liquidity shocks.

We acknowledge that the change in illiquid holdings can be due to either selling securities in the secondary market or delivering them in RIK transactions. We believe it is the latter for two reasons. First, it is difficult to explain why RIK funds would disproportionally sell more illiquid positions, suggesting that the change in holdings are likely to capture in-kind redemptions. Second, in Appendix F, we replace *useRIK* with our indicator for RIK funds (*RIK*) and repeat our analyses in Columns (2) and (3) in Panel A (see Table A.F). The triple interaction term *flow×Amihud×RIK* is insignificant, suggesting that our prior result is not due to the possibility that RIK funds tend to sell more illiquid securities facing investor redemptions, but rather deliver such securities to redeeming investors when they utilize RIK.

6.2.2 Positions with built-in capital gains

In addition to delivering illiquid securities, another potential channel for RIK to mitigate runs is through the delivery of securities with built-in capital gains. In Columns (2) and (3) of Panel A, Table 6, we also examine the change in fund holdings for stocks with different levels of built-in capital gains. Column (2) shows a negative coefficient on *flow*×*cgstock*, suggesting that when funds face outflows, they are less likely to sell securities with more built-in capital gains. This result is consistent with Jin (2006), who shows that capital gains overhang reduces funds' incentive to sell stocks to avoid capital gains distributions to non-redeeming shareholders. Importantly, the coefficient on the triple interaction *flow*×*cgstock*×*useRIK* is positive, i.e., when funds utilize RIK, we observe a greater reduction in their stock positions with *more* built-in capital gains. Since the coefficient on *flow*×*cgstock* shows that in the absence of RIK utilization, funds have less incentive to sell securities with unrealized gains, the coefficient on the triple interaction suggests that funds are likely to deliver (rather than sell) securities with built-in capital gains while using RIK. These results continue to hold in Column (3) where we condition the test on extreme outflows. Overall, this evidence is consistent with funds delivering stocks with more built-in capital gains to redeeming investors in RIK transactions.

As we show in Panel D of Table 3, the flow-performance result is more pronounced among funds following illiquid investment objectives. In Columns (4) and (5), we include only those illiquid funds and their stocks as the trading decisions, flows, and returns are likely distinct from those for the liquid funds. Finally, when computing built-in capital gains, we assume that securities were purchased during the first quarter of 1997 for funds incepted before 1997 (following Jin (2006)). For robustness, we exclude funds incepted before 1997 in Columns (6) and (7) of Panel A. We continue to find RIK funds seem to deliver more illiquid stocks and stocks with more built-in capital gains to redeeming investors in RIK transactions in these robustness checks.

6.2.3 Securities with abnormal short interest

It is perhaps natural for one to conjecture that funds may use RIK to get rid of lemons, i.e., securities that are expected to have worse future performance. If this conjecture is true, it can be another channel for RIK to deter investor redemption and mitigate runs. We use stock's short interest as an ex-ante measure of poor performing stocks (Desai et al., 2002) to investigate this possibility. Specifically, we compute the stock-level abnormal short interest measure *si* following Karpoff and Lou (2010) and interact it with *flow*, *useRIK*, and *flow*×*useRIK*.[19] The last two columns of Panel A, Table 6 show that the coefficient on the triple interaction term *flow*×*si*×*useRIK* is insignificant, suggesting that funds do not systematically deliver stocks with high short interest. Overall, delivering "lemon" stocks does not seem to be a channel through which RIK mitigates run behavior.

6.2.4 Complete selloff and large liquidations

Investors who redeem a large amount despite receiving illiquid securities in kind are likely to face significant funding liquidity needs, and may sell these securities in a short period, which can lead to significant price pressure on such securities. If funds continue to hold a significant amount of the securities they deliver in kind, remaining fund investors may suffer from the adverse impact of the price pressure. In Panel B of Table 6, we examine cases when funds either completely or largely offload the stock positions. The sample is conditional on *flow*<−5% although our results are similar if we condition on *flow*<0. The dependent variable is either *completeliq*, an indicator variable that equals one if the fund completely sells off the position, and zero otherwise; or *largeliq*, an indicator variable that equals one if the fund sells at least 80% of the position, and zero otherwise. In Columns (1) and (2), we find negative coefficients on *flow*, suggesting that greater

[19] We use monthly reported short interest for the last month in a quarter. If there are multiple reports within a month (e.g., on both the 15th and month-end date), we use the short interest closest to the corresponding quarter-end date.

outflows are more likely to trigger a complete or large liquidation of positions. Importantly, the coefficient on *flow*×*Amihud*×*RIK* is also negative. This evidence shows that upon utilization of RIK, funds tend to completely or largely offload their illiquid securities. Consequently, non-redeeming investors bear little cost from any price pressure created by redeeming investors.[20]

However, it may be practically difficult for funds to completely sell or deliver an illiquid position if the position is large to begin with. To examine this issue, we compute the ownership of mutual fund *i* in stock *j* (defined as either the number of shares owned scaled by total shares outstanding; or the position size scaled by fund size following Lou (2012)) and split the sample into high and low fund ownership based on the median ownership values. Columns (3) through (10) in Panel B of Table 6 show that the evidence of completely or largely liquidating an illiquid position is stronger when the fund's ownership in a stock is smaller to begin with. Although a fund may prefer to completely sell or deliver a sizable illiquid position, it is easier to completely exit an illiquid position when the position is small.

6.3 Performance implications of funds' use of RIK

So far, we find evidence consistent with funds utilizing RIK to deliver illiquid securities (complete liquidation of positions to minimize price pressure afterwards) and securities with built-in capital gains to mitigate negative tax externalities for non-redeeming investors. Both results suggest that RIK should help funds mitigate the impact of severe liquidity shocks on fund performance. In this section, we examine the performance implication of RIK usage because better (worse) performance after RIK utilization should give rise to less (more) runs. We test the performance implication by estimating the following regression:

[20] We do not find a positive coefficient on *flow*×*Amihud* in these results. We believe complete liquidation is different from the case of selling in general in Panel A of Table 6. If funds completely sell off their liquid positions, they will be left with little liquidity buffer to accommodate future waves of investor redemptions (Zeng, 2017).

$$Perf_{i,t+1} = \beta_1 + \beta_2 outflow_{i,t} + \beta_3 outflow_{i,t} \times useRIK_{i,t} + controls + \varepsilon_{i,t+1} \quad (5)$$

where the dependent variable $Perf_{i,t+1}$ is fund i's quarterly performance measured by the Fama and French three-factor alpha. Other variables are defined previously. Independent variables are lagged because contemporaneous outflows can be both a cause and consequence of poor performance. Control variables include fund size, expense ratio, and two lags of performance to allow for performance persistence. For consistency with our analyses in this study, we include fund fixed effects although our results are similar if we exclude them.

Table 7 reports the estimation results of Equation (5). Investor outflows lead to worse fund performance with the magnitude of 12.5 basis points for the entire sample (Column (1)), and a more pronounced effect of 18.7 basis points among illiquid funds (Column (2)). In addition, past performance is positively associated with future performance, while fund size and expense ratio are negatively associated with future performance. These findings are consistent with Chen, Goldstein, and Jiang (2010). Importantly, Column (3) shows a positive and significant coefficient on the interaction of RIK utilization and investor outflows. Column (4) shows that the effect of RIK utilization on performance-outflow sensitivity is stronger in the subsample of illiquid funds. Finally, Columns (5) and (6) repeat the analyses within the subsample of RIK funds, and show that our results are not due to heterogeneity between RIK and non-RIK funds.

Taken together, our analyses of the actual in-kind redemptions so far help explain our earlier findings of muted likelihood of investor runs among RIK funds. The amounts delivered are economically large. Funds use RIK as a tool to minimize capital gains tax liability, deliver illiquid securities, and mitigate the adverse impact of large outflows on fund performance. All these results suggest that RIK utilization benefits remaining shareholders, and therefore reduces run incentives.

6.4 Effect of RIK on the price pressure on funds' stockholdings

Although RIK mitigates runs and helps benefit non-redeeming investors, it may impose significant costs on redeeming investors. In the previous section, we document that redeeming investors are likely to receive illiquid securities upon RIK utilization. We now turn our attention to the price impact of flow-induced trading in the event of RIK utilization. Whether RIK utilization creates more price pressure on funds' stockholdings depends on the trading strategy and financial expertise of redeeming investors (compared with that of the fund manager).

Coval and Stafford (2007) show that extreme outflows from mutual funds can lead to flow-induced price pressure on funds' stock holdings. However, since stock sales can be voluntary, we start with the price pressure measure in Edmans, Goldstein, and Jiang (2012), which computes hypothetical sales at the stock level, conditional on extreme outflows (hereafter the EGJ measure):

$$MFFlow_{k,t} = \sum_{j=1}^{n} \frac{F_{j,t} \times Shares_{k,j,t-1} \times PRC_{k,t-1}}{TA_{j,t-1} \times Vol_{k,t}} \tag{6}$$

where $MFFlow_{k,t}$ is the pressure measure induced by fund flows on stock *k* in quarter *t*, $F_{j,t}$ is the *absolute value* of dollar outflows for fund *j* in quarter *t*, $\frac{Shares_{k,j,t-1} \times PRC_{k,t-1}}{TA_{j,t-1}}$ is the ownership of fund *j* on stock *k* as a percentage of the fund's total assets at the beginning of the quarter, and $Vol_{k,t}$ is the dollar trading volume of stock *k* during quarter *t*. The summation is only over observations in which the fund outflows are more than 5%.

To estimate the effect of flow-induced selling pressure on stocks in a fund's portfolio, we estimate the following regression:

$$CAR_{k,t} = \beta_1 + \beta_2 MFFlow_{k,t} + \beta_3 rikown_{k,t} \times MFFlow_{k,t} + controls + \varepsilon_{i,t} \tag{7}$$

where *rikown* is the ownership of funds that use RIK as a proportion of the total mutual fund ownership in stock *k*. $CAR_{k,t}$ is the quarterly cumulative abnormal return of stock *k* in quarter *t*.

Specifically, we use daily stock returns within the quarter and estimate stock's alpha based on the Fama and French (1993) three-factor model. Following Agarwal and Zhao (2019), the control variables include the logarithm of stock's market capitalization, the book-to-market ratio, and total mutual fund ownership on the stock.

We present estimation results in Column (1) of Table 8. The estimated coefficients on the price pressure measure is negative, suggesting that greater pressure from fund outflows has worse impact on the performance of underlying stocks in a fund's portfolio. In addition, the estimated coefficient on the interaction term $rikown \times MFFlow_{k,t}$ is also negative and significant, i.e., given the same price pressure, as more fund owners use RIK, there is greater price pressure on the underlying stock. This suggests that the price pressure generated by redeeming investors who receive in-kind redemption is greater than the selling pressure generated by fund managers.

Wardlaw (2020) argues that the EGJ measure is correlated with stock return and trading volume, and thus may lead to a mechanical relation between *MFFlow* and stock performance. Instead of scaling flow by dollar trading volume as in EGJ, he proposes to scale it by total shares outstanding of the stock. Note that this alternative measure is conservative. Although the EGJ measure can be correlated with stock return and volume, variations in return and volume may still be a direct result of the fund flow pressure (Wardlaw, 2020). For robustness, we repeat our analysis using the price pressure measure scaled by total shares outstanding $Shrout_{k,t-1}$ (i.e., the flow-to-stock measure in Wardlaw, 2020):

$$MFFlow_{k,t} = \sum_{j=0}^{n} \frac{F_{j,t} \times Shares_{k,j,t-1} \times PRC_{k,t-1}}{TA_{j,t-1} \times Shrout_{k,t}} \quad (8)$$

We report estimation results in Column (2) of Table 8. We continue to find that in-kind redemptions have greater price impact on funds' stockholdings.

The EGJ proxy addresses endogeneity concerns related to managers selling funds that have lower expected future returns. Our results on short interest in Table 6 potentially alleviates this concern. Since we show in Table 6 that fund's selling is not proportional (to stock liquidity) as implicitly assumed by the EGJ measure, in Column (3) of Table 8 we use actual selling in Coval and Stafford (2007) instead of hypothetical selling in Edmans, Goldstein, and Jiang (2012) for additional robustness. We continue to find greater price pressure associated with in-kind redemptions. Overall, these results suggest that investors are worse off when they liquidate stocks on their own compared with liquidity transformation services provided by fund managers.

If funds continue to hold stocks that they deliver to investors in kind, the price impact due to redeeming investors selling the stocks could also adversely affect fund performance and remaining investors, and exacerbate run incentives. However, we show earlier that fund performance improves after funds utilize RIK. One explanation based on our earlier finding is that upon utilization of RIK, funds are more likely to completely sell off or largely offload illiquid securities as we see from Panel B of Table 6, suggesting that non-redeeming shareholders bear little cost from the price pressure resulting from the trades of redeeming investors.

8. Conclusions

We provide the first empirical analysis on redemption in kind as a liquidity management tool in open-end mutual funds. We document that RIK funds experience less run-like behavior after poor performance, especially among funds with illiquid investment styles. Redemption in kind also helps alleviate panic-driven redemptions during market stress periods. Further analyses of actual in-kind transactions are consistent with several novel channels through which RIK mitigates investor runs. Specifically, funds tend to use RIK to deliver relatively illiquid securities and better manage capital gains distributions, thus mitigating the impact of outflows on fund

performance. Offsetting these benefits, investors face the risk of receiving illiquid securities and lose liquidity transformation services provided by fund managers. In addition, RIK events are associated with greater price pressure at the stock level, consistent with redeeming investors creating a larger price impact when they liquidate stocks received from RIK transactions.

Overall, our findings help shed light on the economics of RIK, a widely used but little studied liquidity management tool employed by open-end mutual funds. Our study contributes to the literature on investor runs among non-bank financial institutions, and informs the recent debate on the design, implementation, and regulation of liquidity management programs in the open-end mutual fund industry.

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Table 1. Summary Statistics

The sample includes 3,994 actively-managed U.S. domestic equity funds from 1997 to 2017 with 125,588 fund-quarter observations. Panel A shows the number of RIK funds at the beginning of our sample period, the number of funds that switch to RIK funds, and the number of funds that are not RIK funds throughout our sample period. Columns (1) − (5) of Panel B report the summary statistics. *flow* is quarterly net flow as a percentage of fund's TNA at the end of last quarter. *size* is the logarithm of total net asset in millions of dollars. *lage* is the logarithm of the number of months since a fund's inception. *ret* and *sret* are net fund return and style-adjusted return, respectively. *alpha3* is the out-of-sample quarterly alpha from the Fama and French (1993) three-factor model, where factor loadings are estimated based on the prior 24 months of returns. *illiquid* is an indicator variable that is set to one if a fund primarily invests in illiquid styles such as micro-cap, small-cap and mid-cap stocks, and zero otherwise. *instown* is fund ownership by institutional share classes as a fraction of total fund assets under management. *exp_ratio* is the expense ratio of a fund as a percentage of total assets reported in the CRSP mutual fund database. *turn_ratio* is the turnover ratio of a fund reported in the CRSP mutual fund database. *borrow* is the average of four indicator variables that are set to one if a fund reports "Yes" to the following questions on their N-SAR filings, and zero otherwise: Questions 55A and 55B on whether a fund borrows in excess of 1% of its assets either through an overdraft or a bank loan; Question 70O01 on whether borrowing is permitted by fund investment policies; and Question 70O02 on whether a fund engages in borrowing during the reporting period. *load* is an indicator variable that equals one if the fund charges back-end load fees, and zero otherwise. *ilp* is an indicator variable that equals one if a fund can engage in interfund lending, and zero otherwise. *%cash* is the percentage of fund assets held in cash reported in the CRSP mutual fund database. Columns (6) − (8) of Panel B compare the characteristics between RIK and non-RIK funds. Columns (9) − (11) compare the differences before and after RIK adoption for the subsample of funds that switch from non-RIK to RIK. Columns (8) and (11) report the *p*-value for testing the differences under univariate t-test.

Panel A: Redemptions in kind status at fund level

	# of funds	% of sample
Full sample	3,994	
Funds with RIK in 1997	1,115	27.9%
Fund that reserve RIK between 1998 and 2017	1,668	41.8%
Funds without RIK throughout the sample	1,211	30.3%

Panel B: Summary statistics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Mean	Std. Dev.	25%	50%	75%	nonRIK	RIK	*p*-val(Diff)	RIK-pre	RIK-post	p-val(Diff)
flow	0.025	0.168	−0.041	−0.010	0.039	0.038	0.018	0.00	0.056	0.004	0.00
size	5.411	1.965	4.099	5.444	6.771	4.815	5.732	0.00	5.042	5.770	0.00
lage	4.564	1.022	4.043	4.787	5.347	3.702	5.028	0.00	4.344	5.062	0.00
ret	0.021	0.093	−0.023	0.032	0.076	0.025	0.019	0.00	0.028	0.020	0.00
sret	0.000	0.036	−0.017	0.000	0.017	0.000	0.000	0.08	0.001	0.000	0.00
alpha3	−0.002	0.044	−0.022	−0.003	0.017	−0.002	−0.003	0.00	−0.001	−0.003	0.00
illiquid	0.299	0.458	0	0	1	0.214	0.345	0.00	0.263	0.299	0.00
instown	0.282	0.401	0	0.020	0.537	0.267	0.290	0.00	0.202	0.281	0.00
exp_ratio	0.013	0.005	0.010	0.012	0.015	0.013	0.012	0.00	0.013	0.012	0.00
turn_ratio	0.877	0.921	0.340	0.630	1.090	0.933	0.847	0.00	0.869	0.892	0.00
borrow	0.285	0.185	0.250	0.250	0.250	0.185	0.339	0.00	0.295	0.317	0.00
load	0.621	0.485	0	1	1	0.502	0.685	0.00	0.596	0.689	0.00
ilp	0.184	0.388	0	0	0	0.223	0.163	0.00	0.046	0.169	0.00
%Cash	3.371	4.488	0.460	1.980	4.510	4.619	2.699	0.00	5.036	2.741	0.00

Table 2: Characteristics associated with RIK funds

This table presents estimation results of Equation (2) using fund-quarter observations. The dependent variable *RIK* is an indicator variable that equals one if a fund reserves its right to redeem in kind during the quarter, and zero otherwise. *instown_Q5* through *instown_Q2* are indicator variables based on quintiles of institutional ownership (from high to low). Other independent variables are defined earlier. Columns (1) − (5) use the full sample of funds and Column (6) uses the subsample of funds that switch from non-RIK to RIK. Standard errors are clustered at the fund level and *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1) *RIK*	(2) *RIK*	(3) *RIK*	(4) *RIK*	(5) *RIK*	(6) *RIK*
illiquid	0.039**		0.040***	0.038**	0.019	0.029*
	(2.44)		(2.60)	(2.42)	(1.30)	(1.65)
Amihud		−0.036				
		(−0.40)				
instown	−0.004	−0.007		−0.003	−0.009	−0.026
	(−0.22)	(−0.34)		(−0.16)	(−0.48)	(−1.14)
instown_Q5			−0.012			
			(−0.54)			
instown_Q4			−0.001			
			(−0.03)			
instown_Q3			−0.022			
			(−1.20)			
instown_Q2			0.023			
			(1.30)			
%Cash	−0.001	−0.001	−0.002*	−0.001	0.001**	0.000
	(−0.78)	(−0.72)	(−1.92)	(−0.65)	(2.45)	(0.01)
ilp	0.095***	0.101***	0.099***	0.091***	0.037***	0.103***
	(5.86)	(5.91)	(6.22)	(5.64)	(3.96)	(5.62)
borrow	−0.023	−0.030	−0.024	−0.024	−0.012	−0.081***
	(−1.25)	(−1.45)	(−1.37)	(−1.28)	(−1.26)	(−3.46)
size	0.007	0.008	0.006	0.002	0.001	0.005
	(1.54)	(1.61)	(1.30)	(0.48)	(0.18)	(0.88)
load	0.040***	0.045***	0.031**	0.038***	0.000	0.054***
	(2.72)	(2.81)	(2.15)	(2.58)	(0.01)	(2.93)
turn_ratio	0.034***	0.038***	0.029***	0.033***	0.005	0.031***
	(5.55)	(5.68)	(4.79)	(5.38)	(0.94)	(4.31)
exp_ratio	−4.410**	−4.012**	−4.039**	−4.137**	3.137*	−3.732*
	(−2.35)	(−1.97)	(−2.28)	(−2.21)	(1.85)	(−1.82)
lage	0.073***	0.077***	0.057***	0.072***	0.094***	0.083***
	(7.41)	(6.97)	(6.18)	(7.21)	(9.36)	(6.49)
familysize				0.005***		
				(3.24)		
Style×time FE	No	Yes	No	No	No	No
Family FE	No	No	No	No	Yes	No
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	125,588	90,940	125,588	125,588	125,588	48,920
Adj. R^2	0.066	0.073	0.086	0.067	0.687	0.274

Table 3. Redemption in kind and flow-performance sensitivity

This table reports estimation results of Equation (3) using fund-quarter observations. The dependent variable is fund's quarterly flow and the independent variables are lagged fund characteristics. "×" denotes interaction between corresponding variables. Panel A reports the baseline results. Panel B reports the results using entropy-balance matched sample of RIK and non-RIK funds. Panel C reports results for the subsample of institutional and retail share classes, respectively. Panel D shows the results using subsamples of liquid and illiquid funds. Control variables in Panels B, C and D are the same as those in Panel A with fund and time fixed effects, and are omitted for brevity. Standard errors are double-clustered at the fund and quarter levels and *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A

	Baseline		Style Return	Alpha	Family FE	Style×time FE	Switchers	ResidualRIK
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	flow	*flow*	*flow*	*flow*	*flow*	*flow*	*flow*	*flow*
perfpos	0.151***	0.160***	0.102*	0.493***	0.137***	0.153***	0.139***	0.148***
	(3.17)	(3.54)	(1.92)	(5.77)	(3.32)	(3.52)	(3.91)	(3.07)
perfneg	0.114***	0.164***	0.183***	0.488***	0.153***	0.155***	0.193***	0.113***
	(3.40)	(4.42)	(6.29)	(10.51)	(3.12)	(4.45)	(5.37)	(3.36)
RIK×perfpos		−0.018	−0.012	0.076	−0.029	−0.016	−0.017	−0.003
		(−0.56)	(−0.35)	(0.77)	(−0.95)	(−0.54)	(−0.36)	(−0.10)
RIK×perfneg		−0.068**	−0.067***	−0.140**	−0.064**	−0.061**	−0.119***	−0.067**
		(−2.61)	(−2.90)	(−2.36)	(−2.14)	(−2.57)	(−3.58)	(−2.41)
RIK	−0.007*	−0.007*	−0.008**	−0.010***	−0.006	−0.007*	−0.008	−0.007*
	(−1.96)	(−1.86)	(−2.21)	(−2.84)	(−1.70)	(−1.84)	(−1.40)	(−1.95)
size	−0.026***	−0.026***	−0.026***	−0.024***	−0.008***	−0.026***	−0.024***	−0.026***
	(−13.18)	(−13.20)	(−13.12)	(−11.15)	(−7.18)	(−12.94)	(−10.26)	(−13.20)
lagflow	0.222***	0.222***	0.223***	0.216***	0.228***	0.217***	0.215***	0.222***
	(13.40)	(13.40)	(13.43)	(12.34)	(10.88)	(13.20)	(9.12)	(13.40)
turn_ratio	−0.002	−0.002	−0.002	−0.002	−0.001	−0.002	−0.001	−0.002
	(−1.28)	(−1.26)	(−1.21)	(−1.12)	(−0.88)	(−1.28)	(−0.87)	(−1.27)
exp_ratio	0.066	0.068	0.088	0.063	0.803	0.037	−0.344	0.074
	(0.08)	(0.08)	(0.10)	(0.07)	(1.25)	(0.04)	(−0.46)	(0.09)
lage	−0.046***	−0.046***	−0.046***	−0.042***	−0.017***	−0.046***	−0.044***	−0.046***

	(−14.07)	(−14.08)	(−13.87)	(−10.28)	(−5.33)	(−14.14)	(−9.11)	(−14.05)
lage×perf	−0.000**	−0.000*	−0.000	−0.001***	−0.000	−0.000**	−0.000	−0.000**
	(−2.50)	(−1.95)	(−1.06)	(−4.38)	(−0.07)	(−2.13)	(−0.86)	(−2.11)
%cash	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.002***	0.001***
	(7.69)	(7.74)	(7.78)	(7.48)	(7.90)	(7.62)	(5.01)	(7.64)
familysize	0.000	0.000	0.000	0.001	−0.016***	0.000	−0.000	0.000
	(0.35)	(0.35)	(0.30)	(1.15)	(−10.24)	(0.27)	(−0.03)	(0.34)
instown	0.096***	0.096***	0.096***	0.090***	0.080***	0.096***	0.085***	0.095***
	(4.05)	(4.05)	(4.05)	(3.86)	(5.03)	(4.10)	(4.06)	(4.04)
Fund and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	125,588	125,588	125,588	125,588	125,588	125,588	125,588	125,588
Adj. R^2	0.256	0.256	0.256	0.234	0.250	0.262	0.223	0.256

Panel B: Matched sample

Perf. measures	Raw Return	Style Return	Alpha
	(1)	(2)	(3)
	flow	*flow*	*flow*
RIK×perfpos	−0.012	−0.007	0.071
	(−0.45)	(−0.25)	(0.82)
RIK×perfneg	−0.054**	−0.051**	−0.140**
	(−2.36)	(−2.51)	(−2.34)
Controls	Yes	Yes	Yes
Fund and time FEs	Yes	Yes	Yes
Observations	125,588	125,588	125,588
Adj. R^2	0.258	0.258	0.240

Panel C: Institutional and retail share classes

Samples	Institutional shares			Retail shares		
Perf. measures	Raw Return	Style Return	Alpha	Raw Return	Style Return	Alpha
	(1)	(2)	(3)	(4)	(5)	(6)
	flow	*flow*	*flow*	*flow*	*flow*	*flow*
RIK×*perfpos*	0.008	0.045	0.176	−0.020	−0.007	−0.029
	(0.16)	(1.09)	(0.97)	(−0.87)	(−0.25)	(−0.39)
RIK×*perfneg*	−0.150***	−0.129***	−0.258*	−0.065***	−0.068***	−0.088*
	(−2.82)	(−2.93)	(−1.86)	(−3.04)	(−3.22)	(−1.67)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fund and time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	70,305	70,305	70,305	98,962	98,962	98,962
Adj. R^2	0.146	0.146	0.141	0.252	0.251	0.239

Panel D: Liquid and illiquid funds

Perf. measures	Raw Return		Style Return		Alpha	
Samples	liquid	illiquid	liquid	illiquid	liquid	illiquid
	(1)	(2)	(3)	(4)	(5)	(6)
	flow	*flow*	*flow*	*flow*	*flow*	*flow*
RIK×*perfpos*	−0.067*	0.007	−0.054	0.011	−0.040	0.135
	(−1.76)	(0.18)	(−1.28)	(0.27)	(−0.24)	(1.23)
RIK×*perfneg*	−0.025	−0.090***	−0.028	−0.092***	−0.072	−0.185**
	(−1.10)	(−2.94)	(−0.99)	(−3.31)	(−0.86)	(−2.63)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fund and time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	84,975	40,613	84,975	40,613	84,975	40,613
Adj. R^2	0.250	0.284	0.250	0.284	0.225	0.269

Table 4. Investor redemption behavior during market distress

This table reports investor redemption behavior around episodes of market distress. In Columns (1) and (2), *stress* is equal to one for the last quarter of 1998, the last two quarters of 2007, and the year of 2008, and zero otherwise. *pre* is equal to one from July 2006 to June 2007 and from July 1998 to September 1998, and zero otherwise. In Columns (3) and (4), *stress* is equal to one during the quarters when the VIX index is above the 75th percentile, and zero otherwise. *pre* equals one for the one quarter before each of the high VIX quarters, and zero otherwise. Columns (1) and (3) report results for the entire sample, while Columns (2) and (4) report findings for the subsample of funds that switch from non-RIK to RIK. The regressions are based on matched sample of RIK funds with non-RIK funds in Columns (1) and (3), and among RIK funds, before and after the switch in Columns (2) and (4). Standard errors are double-clustered at the fund and quarter levels and *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	Crises		High VIX	
Samples	All funds	Switchers	All funds	Switchers
	(1)	(2)	(3)	(4)
	flow	*flow*	*flow*	*flow*
stress	−0.009**	−0.015***	−0.007**	−0.013***
	(−2.18)	(−3.00)	(−2.21)	(−3.25)
stress×RIK	0.007***	0.009**	0.007*	0.011**
	(2.80)	(2.31)	(2.03)	(2.09)
pre	−0.004	−0.003	−0.004	0.006
	(−0.90)	(−0.79)	(−0.42)	(0.54)
pre×RIK	0.003	0.003	0.002	−0.008*
	(1.00)	(0.54)	(0.85)	(−1.87)
ret	0.119***	0.114***	0.127***	0.115***
	(4.34)	(3.72)	(4.60)	(3.72)
inkind	−0.005	−0.008*	−0.006*	−0.006*
	(−1.59)	(−1.85)	(−1.72)	(−1.79)
size	−0.025***	−0.024***	−0.026***	−0.024***
	(−13.02)	(−10.58)	(−13.58)	(−10.66)
laflow	0.228***	0.198***	0.231***	0.198***
	(13.88)	(8.72)	(14.85)	(8.70)
load	0.012***	0.006	0.010**	0.006
	(2.91)	(1.22)	(2.63)	(1.22)
turn_ratio	−0.000	−0.001	−0.000	−0.001
	(−0.24)	(−0.35)	(−0.32)	(−0.34)
exp_ratio	0.168	−0.284	−0.243	−0.281
	(0.21)	(−0.39)	(−0.33)	(−0.38)
lage	−0.034***	−0.040***	−0.040***	−0.040***
	(−8.99)	(−7.77)	(−11.01)	(−7.87)
lage×ret	−0.000*	−0.000*	−0.000**	−0.000*
	(−2.03)	(−1.77)	(−2.50)	(−1.73)
%cash	0.001***	0.001***	0.001***	0.001***
	(4.58)	(6.68)	(7.77)	(6.60)

familysize	0.003***	0.002***	0.002***	0.002***
	(7.46)	(4.79)	(5.17)	(5.03)
instown	0.085***	0.073***	0.077***	0.074***
	(3.43)	(3.23)	(3.23)	(3.22)
familyflow	0.415***	0.474***	0.407***	0.473***
	(11.07)	(11.08)	(11.14)	(11.07)
Fund and time FEs	Yes	Yes	Yes	Yes
Observations	126,109	54,521	126,100	54,521
Adj. R^2	0.268	0.242	0.267	0.242

Table 5. Descriptive statistics of actual RIK utilization

Panel A reports summary statistics of in-kind transactions. Panel B relates characteristics of RIK funds to utilization of in-kind transactions. *useRIK* is an indicator variable that is equal to one if the RIK fund reports delivery of securities in kind during the corresponding period, and zero otherwise. *realcapgain* and *distcapgain* are realized capital gain (N-SAR Q#72AA) and capital gain distribution (N-SAR Q#72EE) as a percentage of a fund's TNA, respectively. *outflow* is an indicator variable for net outflows, and *largeout* is an indicator variable for large outflows of more than 5%. Standard errors are clustered at the fund level and *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Summary statistics of in-kind transactions

	N	Mean	Std. Dev.	25%	50%	75%
RIK usage indicator	2,985	1	1	1	1	1
RIK amount ($mil)	1,016	153	235	24	70	164
RIK amount / TNA (%)	1,016	10.4	16.1	1.3	4.0	12.1

Panel B: Characteristics associated with in-kind transactions

	(1) *useRIK*	(2) *useRIK*	(3) *useRIK*
flow	−0.009***	−0.006***	−0.005**
	(−4.06)	(−2.95)	(−2.50)
outflow		0.002*	
		(1.86)	
largeout			0.003***
			(2.97)
realcapgain	0.037**	0.037**	0.036**
	(2.34)	(2.31)	(2.24)
distcapgain	0.017	0.017	0.017
	(0.79)	(0.77)	(0.76)
ret	0.001	0.001	0.001
	(0.19)	(0.34)	(0.22)
size	0.007***	0.007***	0.007***
	(6.24)	(6.31)	(6.32)
exp_ratio	−0.316	−0.314	−0.310
	(−1.21)	(−1.20)	(−1.19)
turn_ratio	0.000	0.000	0.000
	(0.57)	(0.54)	(0.51)
lage	−0.016***	−0.016***	−0.016***
	(−4.17)	(−4.19)	(−4.18)
%cash	−0.000*	−0.000*	−0.000*
	(−1.88)	(−1.80)	(−1.79)
Fund and time FEs	Yes	Yes	Yes
Observations	83,516	83,516	83,516
Adj. R^2	0.132	0.132	0.132

Table 6. Changes in funds' stock portfolio after RIK utilization

This table reports the estimation results of Equation (4), which examines changes in mutual funds' stock portfolio in response to outflows. In Panel A, the dependent variable is the percentage change of a fund's holdings in a stock during a quarter after adjusting for stock splits. *Amihud* is the stock's Amihud (2002) illiquidity measure, estimated based on the stock's daily return and trading volume over the prior quarter. *cgstock* is the dollar amount of a stock's unrealized capital gains scaled by the stock's dollar position size if the stock has built-in capital gains, and zero if the stock has built-in capital losses. *si* is the stock-level abnormal short interest measure. Columns (1) −(3), (8), and (9) use the full sample of funds. Columns (4) and (5) use the subsample of funds following illiquid styles. Columns (6) and (7) drop the funds that are incepted before 1997. In Panel B, *completeliq* is an indicator variable that is equal to one if the position is completely liquidated, and zero otherwise. *largeliq* is an indicator variable that is equal to one if the position is liquidated by at least 80%, and zero otherwise. In Columns (3) − (6), fund ownership on the stock is defined as shares owned scaled by total shares outstanding. In Columns (7) − (10), fund ownership is defined as the dollar value of position size scaled by total fund assets. Observations are at fund-stock-quarter level and standard errors are clustered at the fund level as in Lou (2012). *t*-statistics are reported in parentheses, and ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A

Samples	Full flow<0	Full flow<0	Full flow<–5%	Illiquid flow<0	Illiquid flow<–5%	Post1997 flow<0	Post1997 flow<–5%	Full flow<0	Full flow<–5%
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	change	*change*	*change*	*change*	*change*	*change*	*change*	*change*	*change*
flow	0.877***	0.825***	0.841***	0.844***	0.835***	0.807***	0.847***	0.931***	1.006***
	(38.47)	(24.55)	(20.12)	(9.29)	(7.68)	(17.55)	(12.97)	(27.62)	(27.42)
flow×useRIK		−0.010	−0.075	−0.118	−0.191	−0.058	−0.230	−0.073	−0.119
		(−0.11)	(−0.77)	(−0.56)	(−0.89)	(−0.39)	(−1.53)	(−0.72)	(−0.89)
useRIK		−0.020*	−0.015	−0.040**	−0.037	−0.008	−0.037*	−0.020*	−0.016
		(−1.77)	(−0.79)	(−2.31)	(−1.11)	(−0.51)	(−1.90)	(−1.66)	(−0.73)
Amihud		−0.077***	−0.061**	−0.120***	−0.131**	−0.066*	0.028	−0.092***	−0.079***
		(−5.17)	(−2.39)	(−4.12)	(−2.03)	(−1.77)	(0.56)	(−5.60)	(−2.60)
flow×Amihud		−3.130***	−3.773***	−2.664**	−2.509*	−2.230*	−0.880	−4.204***	−5.047***
		(−3.40)	(−3.96)	(−1.98)	(−1.87)	(−1.74)	(−0.63)	(−4.02)	(−4.52)
flow×Amihud×useRIK		8.507*	14.178***	11.051***	13.038***	15.960***	17.665***	11.832**	17.416***
		(1.87)	(2.87)	(2.75)	(3.24)	(2.92)	(2.74)	(2.47)	(3.37)
Amihud×useRIK		0.036	0.109	0.151**	0.263**	0.375	0.376	0.106	0.170*
		(0.54)	(1.12)	(2.10)	(2.01)	(1.63)	(1.21)	(1.44)	(1.88)

flow×cgainstock		−0.187***	−0.367***	−0.113	−0.102	−0.395***	−0.640***	−0.140*	−0.416***
		(−3.31)	(−5.86)	(−0.39)	(−0.22)	(−5.11)	(−7.62)	(−1.79)	(−5.42)
flow×cgstock×useRIK		0.591**	0.544**	1.415*	2.484*	2.236**	5.379***	0.734**	0.674*
		(2.26)	(2.18)	(1.77)	(1.90)	(2.02)	(2.90)	(2.33)	(1.86)
cgainstock		−0.421***	−0.458***	−0.637***	−0.640***	−0.483***	−0.544***	−0.415***	−0.459***
		(−45.33)	(−36.09)	(−19.52)	(−8.86)	(−37.04)	(−28.19)	(−38.40)	(−32.17)
cgainstock×useRIK		0.155***	0.129**	0.263***	0.390***	0.148***	0.442***	0.152***	0.128*
		(2.63)	(2.24)	(4.25)	(3.16)	(2.63)	(4.16)	(2.58)	(1.87)
flow×si								−0.141	−0.196
								(−1.15)	(−1.49)
flow×si×useRIK								0.429	0.132
								(0.55)	(0.24)
si								0.001	0.002
								(0.82)	(1.08)
si×useRIK								−0.000	−0.004
								(−0.05)	(−0.88)
Fund and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,406,800	5,627,024	1,735,837	2,119,096	674,997	2,708,514	843,280	3,131,339	967,989
Adj. R^2	0.039	0.058	0.089	0.030	0.050	0.055	0.084	0.060	0.093

Panel B

Samples	Full		Ownership=shares/shrout				Ownership=shares×price/tna			
			Low	Low	High	High	Low	Low	High	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	completeliq	*largeliq*	*completeliq*	*largeliq*	*completeliq*	*largeliq*	*completeliq*	*largeliq*	*completeliq*	*largeliq*
flow	−0.102***	−0.168***	−0.065***	−0.046***	−0.114***	−0.110***	−0.110***	−0.187***	−0.059***	−0.120***
	(−5.89)	(−7.91)	(−3.43)	(−2.61)	(−4.65)	(−3.48)	(−4.91)	(−6.99)	(−2.73)	(−4.67)
flow×Amihud×useRIK	−4.422**	−5.717**	−16.749***	−21.748***	−3.072**	−2.228	−6.679**	−8.308***	−3.956	−5.211
	(−2.18)	(−2.18)	(−2.63)	(−2.90)	(−2.26)	(−1.59)	(−2.55)	(−2.82)	(−1.54)	(−1.58)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund and time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,735,837	1,735,837	883,194	883,194	852,643	852,643	885,170	885,170	860,667	860,667
Adj. R^2	0.048	0.049	0.234	0.110	0.226	0.089	0.155	0.151	0.192	0.186

Table 7. RIK utilization and fund performance after large investor redemptions

This table reports estimation results of performance-outflow regression in Equation (5). The dependent variable *alpha3* is quarterly Fama and French (1993) three-factor alpha and independent variables are lagged fund characteristics. *alpha3* is converted to percentage points for expositional convenience. *outflow* is an indicator variable for net outflows. *lagret1* and *lagret2* are fund returns lagged by one and two quarters, respectively. Columns (1) through (4) use the entire sample and Columns (5) and (6) use the subsample of RIK funds. Observations are at the fund-quarter level and standard errors are clustered at the fund level as in Chen, Goldstein, and Jiang (2010). *t*-statistics are reported in parentheses, and ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Samples	All	Illiquid	All	Illiquid	RIK	Illiquid RIK
	(1)	(2)	(3)	(4)	(5)	(6)
	alpha3	*alpha3*	*alpha3*	*alpha3*	*alpha3*	*alpha3*
outflow	−0.125***	−0.187***	−0.129***	−0.199***	−0.162***	−0.204***
	(−5.96)	(−4.85)	(−6.08)	(−5.08)	(−6.60)	(−4.57)
useRIK×outflow			0.217*	0.534**	0.250**	0.437*
			(1.92)	(2.52)	(2.12)	(1.93)
useRIK			−0.104	−0.279	−0.067	−0.150
			(−1.04)	(−1.47)	(−0.67)	(−0.77)
lagret1	1.821***	2.721***	1.820***	2.721***	2.014***	2.999***
	(11.50)	(10.64)	(11.49)	(10.64)	(10.77)	(9.04)
lagret2	0.919***	1.255***	0.919***	1.255***	0.737***	1.436***
	(7.06)	(6.37)	(7.05)	(6.37)	(5.60)	(6.91)
size	−0.012**	−0.025**	−0.012**	−0.026**	−0.024**	−0.033**
	(−2.12)	(−2.11)	(−2.15)	(−2.18)	(−2.02)	(−2.38)
exp_ratio	−15.828***	−16.452***	−15.756***	−16.294***	−14.061***	−10.902
	(−5.24)	(−2.72)	(−5.20)	(−2.69)	(−4.53)	(−1.63)
Fund and time FEs	Yes	Yes	Yes	Yes	Yes	Yes
Observations	125,588	40,613	125,588	40,613	83,516	26,553
Adj. R^2	0.026	0.049	0.026	0.049	0.009	0.011

Table 8. Effects of RIK utilization on price pressure

This table reports estimation results of price pressure analysis conditional on large investor outflows in Equation (7). The dependent variable *CAR* is the cumulative abnormal return in percentage points estimated from the Fama and French (1993) three-factor model. Quarterly *CAR* is converted to percentage points for expositional convenience. *MFFlow* is the stock-level price pressure measure. *rikown* is the ownership by funds that utilize in-kind redemptions during a given quarter as a fraction of total fund ownership. *size* is the logarithm of stock's market capitalization and *btm* is the book-to-market ratio. Ownership is the total mutual fund ownership on the stock. In Column (1), the price pressure measure is computed as in Edmans, Goldstein, and Jiang (2012). In Column (2), the price pressure measure is scaled by total shares outstanding of a stock as in Wardlaw (2020). In Column (3), the price pressure measure is computed as in Coval and Stafford (2007). Observations are at the stock-quarter level and standard errors are clustered at the stock level as in Agarwal and Zhao (2019). *t*-statistics are reported in parentheses, and ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Pressure Measures	CGJ	Waldlaw	Coval Stafford
	(1)	(2)	(3)
	CAR	*CAR*	*CAR*
MFFlow	−0.107***	−0.078***	−0.044***
	(−4.78)	(−3.08)	(−2.70)
rikown×*MFFlow*	−1.624**	−1.880**	−13.535**
	(−1.99)	(−2.27)	(−2.23)
rikown	−2.897***	−2.775***	−3.492***
	(−3.94)	(−3.75)	(−4.90)
size	0.318***	0.319***	0.260***
	(6.81)	(6.84)	(4.93)
btm	−0.000	−0.000	−0.000
	(−0.10)	(−0.00)	(−0.32)
ownership	0.001***	0.001***	0.000
	(3.44)	(2.76)	(0.23)
Time FEs	Yes	Yes	Yes
Observations	295,416	295,416	295,416
Adj. R^2	0.032	0.032	0.029

Appendix A: Tax consequences of in-kind redemptions

In this Appendix, we create two numerical examples to illustrate tax consequences when fund managers meet redemptions in cash or in kind. At the fund level, capital gain tax is recognized when managers meet redemptions in cash, since capital gains are considered as distributed to non-redeeming fund investors. When managers meet redemptions in kind, capital gain taxes are deferred until non-redeeming shareholders sell their fund shares. For redeeming shareholders, the tax consequence of in-kind redemption is the same as if shareholders redeem in cash, i.e., the shareholder pays for the tax on share price appreciation.

Suppose on date T1, the fund only holds one share of stock A, valued at $90. The fund only issues one fund share to one investor, investor 1. On date T2, the stock price appreciates to $100 and investor 2 buys one additional share of the fund, which now has 2 shares invested in stock A. On date T3, the stock price appreciates to $120 and investor 1 redeems 1 share at $120. For simplicity, suppose the fund follows FIFO (first in, first out) and to satisfy the redemption request by investor 1, sells the 1 share of stock A that was previously bought on date T1. Further, suppose the capital gain distributed to investor 2 on date T3 is not reinvested (although tax consequences would be the same if she does). The following two tables outline the tax consequences associated with the two scenarios where investor 1 receives her redemption in cash or in kind.

Pay investor 1 in cash

	NAV	Fund portfolio	Investor 1	Investor 2
T 1	$90	1 share @ $90	Owns 1 share (tax basis $90)	
T 2	$100	2 shares @ $100	Owns 1 share	Owns 1 share (tax basis $100)
T 3	$90[1]	1 share @ $120 (sell one with basis of $90 and realized capital gain of $30 distributed to investor 2)	Redeems 1 share @$120, pay tax on $120−$90	Owns 1 share @ $90 plus $30 distributed realized capital gain, pay tax on $30
T 4	$90	Sell @ 120		Redeems in cash and claim a tax loss of −$10(=$90−$100)

Pay investor 1 in kind

	NAV	Fund portfolio	Investor 1	Investor 2
T 1	$90	1 share @ $90	Owns 1 share (tax basis $90)	
T 2	$100	2 shares @ $100	Owns 1 share	Owns 1 share (tax basis $100)
T 3	$120	1 share @ $120 (fund delivers the one with basis of $90)	Redeems 1 share in kind (pay tax on $120−$90)	Owns 1 share (no tax event)
T 4	$120	Sell @ $120		Redeems in cash (tax on capital gain of $120−$100=$20)

As we can see, for the redeeming investor 1, the tax consequence is the same regardless of whether her redemption is paid in cash or in kind. For the non-redeeming investor 2, the redemption in cash scenario generates a $30 capital gain bill on date T3 while the redemption in kind scenario doesn't generate any tax event on T3. However, ignoring the time value of money, the total tax liability for investor 2 in both cases is $20. In-kind redemption simply defers the tax for investor 2 till date T4.

[1] The distribution of capital gain decreases the net asset value (NAV) of the fund by the amount distributed. See https://www.investopedia.com/terms/c/capitalgainsdistribution.asp.

The time value can be substantial though, if the investor stays invested in the fund for a long time between T3 and T4. In addition, investor 2 is forced to pay a tax bill on date T3 if investor 1's redemption is paid in cash, while under the in-kind redemption scenario, investor 2 has more flexibility to manage her tax liability. For example, she can voluntarily redeem her shares at a more preferred time between T3 and T4 for tax planning purposes.

Appendix B: Matched sample analysis of flow-performance sensitivity

In this Appendix, we describe our matched sample approach to provide evidence that the difference in flow-performance relations among RIK and non-RIK funds are not due to potential self-selection of investors into funds with different characteristics. Specifically, we use an entropy-balanced sample of treatment (RIK) and control (non-RIK) funds. Entropy balancing is a reweighting technique that generalizes the propensity score matching to achieve significantly improved matching between the treatment and control samples (Hainmueller, 2012; Agarwal and Zhao, 2019). Unlike the traditional propensity score matching where a control fund is assigned a weight equal to either one or zero, entropy balancing assigns a continuous set of weights to control funds. Therefore, it creates a set of control counterfactuals that match more closely to the treatment funds. Moreover, the entropy balancing approach can better utilize the information in control funds because most control funds are assigned non-zero weights instead of being dropped from the analysis. The matching results using entropy balancing are reported in Table A.B which shows that the matched characteristics of the treatment group (RIK funds) and control group (non-RIK funds) are almost identical both economically and statistically.

Table A.B. Matched sample

This table shows differences of fund characteristics between RIK funds and matched non-RIK funds. *perfpos* is equal to the corresponding performance measure if the performance figure is positive, and zero otherwise. *perfneg* is equal to the performance measure if performance is negative, and zero otherwise. *duration* is the duration measure of Cremers and Pareek (2015, 2016). Other variables are defined previously in Table 1.

	Treatment	Control
perfpos (*ret*)	0.046	0.047
perfneg (*ret*)	−0.021	−0.021
perfpos (s*ret*)	0.028	0.028
perfneg (s*ret*)	−0.028	−0.028
perfpos (*alpha3*)	0.010	0.010
perfneg (*alpha3*)	−0.013	−0.013
size	5.732	5.724
load	0.685	0.685
flow	0.018	0.018
lage	5.028	5.027
turn_ratio	0.847	0.847
exp_ratio	0.012	0.013
%cash	2.699	2.699
illiquid	0.345	0.345
borrow	0.339	0.339
ilp	0.163	0.164
instown	0.290	0.291
duration	9.619	9.619

Appendix C: Corporate bond funds

Sample selection

We select our corporate bond mutual fund sample from the Center for Research in Security Prices (CRSP) Survivorship-Bias-Free US Mutual Fund Database. Our sample period is from 1997 to 2017. We classify mutual funds as corporate bond funds based on the CRSP objective code, following Goldstein, Jiang, and Ng (2017) and Choi and Kronlund (2018). Specifically, these are funds with CRSP objective codes I, ICQH, ICQM, ICQY, ICDI, ICDS, or IC, which corresponds to Lipper objective codes A, BBB, IID, SII, SID, USO, HY, GB, FLX, MSI, or SFI. We exclude any index funds, ETFs, or ETNs from our sample. Our corporate bond sample consists of 1,850 unique funds. Following Goldstein, Jiang, and Ng (2017), we conduct our analyses at the share class-month level although our results are qualitatively similar if we use fund level quarterly observations as we do in the main text of the paper.

Data collection and variable construction

We use a similar procedure to identify bond mutual funds that reserve RIK as we do for equity mutual funds in our main analyses. Specifically, we first collect all Form N-18F-1 filings in the SEC EDGAR database from 1997 to 2017, and label funds as RIK funds after they file the form. Second, for funds that file for the exemption before 1997, we use the comprehensive list of keywords related to in-kind redemptions and manually check the prospectuses containing the keywords to confirm that these funds indeed reserve their rights to redeem in kind.

We estimate out-of-sample alphas by taking the intercepts from fund-by-fund 24-month rolling-window regressions of excess corporate bond fund returns (in excess of the risk-free rate), regressed on excess returns of both the aggregate bond market and stock market. The aggregate bond market return is measured by Vanguard Total Bond Market Index Fund return and the aggregate stock market return is the return on the CRSP value-weighted index.

Table A.C. Redemption in kind and flow-performance sensitivity for bond funds

This table reports the results of the flow-performance analyses for a sample of corporate bond mutual funds between January 1997 and December 2017. Bond funds are selected from the CRSP mutual fund database following the procedure in Goldstein, Jiang, and Ng (2017). Out-of-sample alphas are estimated from the intercepts of fund-by-fund 24-month rolling-window regressions of excess corporate bond fund returns on excess returns of the Vanguard Total Bond Market Index Fund return and the CRSP value-weighted stock index return. *negdum* is an indicator variable that is equal to one if a fund's corresponding performance is negative, and zero otherwise. The other variables are defined previously Table 2. The first three columns use raw return as performance measure, the next three columns use style-adjust return, and the last three columns use fund alpha. The regressions use share class-month observations and include share class and month fixed effects. The standard errors are double-clustered at the share class and time levels. *t*-statistics are reported in parentheses and ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively

	Raw Return			Style Return			Alpha		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	flow	*flow*	*flow*	*flow*	*flow*	*flow*	*flow*	*flow*	*flow*
perfpos	0.171***	0.144***		0.129***	0.087*		0.081	0.033	
	(4.64)	(3.59)		(3.17)	(1.89)		(1.58)	(0.62)	
perfneg	0.245***	0.306***		0.203***	0.269***		0.139**	0.246***	
	(5.00)	(5.78)		(4.36)	(5.64)		(2.30)	(3.98)	
RIK×*perfpos*		0.053			0.083			0.094	
		(1.17)			(1.49)			(1.56)	
RIK×*perfneg*		−0.120			−0.132**			−0.213**	
		(−1.62)			(−2.01)			(−2.57)	
perf			0.114***			0.059			0.016
			(2.73)			(1.19)			(0.29)
negdum×*perf*×*RIK*			−0.179*			−0.213**			−0.320***
			(−1.83)			(−2.20)			(−2.91)
negdum×*RIK*			−0.000			−0.001			−0.001**
			(−0.40)			(−1.47)			(−1.97)
RIK×*perf*			0.045			0.041			0.052
			(0.91)			(0.65)			(0.82)
negdum×*perf*			0.135**			0.185***			0.204***
			(2.17)			(3.00)			(2.80)

negdum			−0.002***			−0.001*			−0.001*
			(−2.79)			(−1.84)			(−1.95)
RIK		0.002	0.002		0.002	0.002		0.002	0.002
		(0.96)	(1.01)		(0.86)	(1.15)		(0.85)	(1.20)
size	−0.009***	−0.009***	−0.009***	−0.009***	−0.009***	−0.009***	−0.009***	−0.009***	−0.009***
	(−22.32)	(−22.32)	(−22.33)	(−22.32)	(−22.32)	(−22.31)	(−22.32)	(−22.33)	(−22.34)
lage	−0.016***	−0.016***	−0.016***	−0.016***	−0.016***	−0.016***	−0.016***	−0.016***	−0.016***
	(−12.58)	(−12.57)	(−12.55)	(−12.76)	(−12.75)	(−12.75)	(−12.77)	(−12.75)	(−12.77)
lage×perf	−0.001***	−0.001***	−0.001***	−0.000	−0.000	−0.000*	−0.000	−0.000	−0.000*
	(−2.89)	(−2.89)	(−3.14)	(−1.47)	(−1.46)	(−1.74)	(−1.44)	(−1.45)	(−1.72)
lagflow	0.138***	0.138***	0.138***	0.138***	0.138***	0.138***	0.139***	0.139***	0.138***
	(18.00)	(18.00)	(18.00)	(18.00)	(18.00)	(18.01)	(18.20)	(18.20)	(18.21)
load	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***	0.006***
	(4.35)	(4.37)	(4.38)	(4.36)	(4.38)	(4.41)	(4.35)	(4.40)	(4.41)
turn_ratio	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000	−0.000
	(−0.23)	(−0.32)	(−0.33)	(−0.22)	(−0.31)	(−0.32)	(−0.19)	(−0.29)	(−0.33)
exp_ratio	−0.943***	−0.948***	−0.947***	−0.942***	−0.947***	−0.946***	−0.941***	−0.945***	−0.939***
	(−3.89)	(−3.90)	(−3.90)	(−3.88)	(−3.90)	(−3.89)	(−3.88)	(−3.89)	(−3.87)
%cash	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
	(2.18)	(2.23)	(2.23)	(2.19)	(2.24)	(2.23)	(2.15)	(2.21)	(2.24)
Share class FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	459,813	459,813	459,813	459,813	459,813	459,813	459,567	459,567	459,567
Adj. R^2	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088	0.088

Appendix D: Investor awareness of RIK

To examine the role of investor awareness of the RIK, we first calculate web page views of Form N-18F-1 filings recorded in SEC EDGAR's web server log files. We focus on this particular form because unlike other filings such as fund financial statements and prospectuses, Form N-18F-1 is specifically about RIK and does not contain any other information such as fund performance or risks, thus provide better identification of information related to RIK. The page view *per filing per year* has a median value of 21, and the 25th and 75th percentile values are 5 and 40, respectively. As a comparison, the page view of fund prospectus, perhaps one of the most important regulatory filings, has a median of 43 views per filing per year, and the 25th and 75th percentile values are at 12 and 99, respectively. Therefore, although page views of Form N-18F-1 are fewer than those on fund prospectuses, they are still economically significant especially given that fund prospectuses contain much more information than Form N-18F-1.

We then construct an indicator variable to capture those Form N-18F-1 filings with greater number of page views. Specifically, *Highview* is equal to one if the aggregate number of page views of fund's Form N-18F-1 up to a given quarter ranks in the top quintile among all RIK funds, and zero otherwise.[1] Table A.D uses the subsample of RIK funds to conduct the flow-performance analysis and shows the importance of investor awareness. The interaction term between *Highview* and *perfneg* is negative and economically significant. Although RIK funds in general experience less investor redemption after poor performance, those with more page views of their Form N-18F-1 experience even less redemption after poor performance.

[1] The aggregate number of page views increases over time for a given fund. Therefore, one potential concern is that our results on investor awareness may be due to the possibility that funds with longer track history experience less investor runs. To address this issue, we control for the interaction between fund age and performance in Table A.D (as we do for all the previous flow-performance analyses in Table 3).

Table A.D. Investor awareness

This table reports estimation results of Equation (3) using fund-quarter observations. The dependent variable is fund's quarterly flow and the independent variables are lagged fund characteristics. "×" denotes interaction between corresponding variables. The analysis uses the subsample of RIK funds. *Highview* is an indicator variable that is equal to one if the aggregate number of page views on fund's Form N-18F-1 up to a given quarter ranks in the top quintile among all RIK funds, and zero otherwise. Control variables are the same as those in Table 3 and are omitted for brevity. Standard errors are double-clustered at the fund and time levels and *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Perf. measures	Raw Return	Style Return	Alpha
	(1)	(2)	(3)
	flow	*flow*	*flow*
Highview×*perfpos*	0.082	0.037	0.126
	(1.42)	(0.66)	(0.95)
Highview×*perfneg*	−0.152***	−0.089**	−0.244*
	(−2.85)	(−2.11)	(−1.93)
Highview	0.000	0.003	0.001
	(0.01)	(0.48)	(0.14)
Controls	Yes	Yes	Yes
Fund and time FEs	Yes	Yes	Yes
Observations	83,516	83,516	83,516
Adj. R^2	0.284	0.283	0.260

Appendix E: Examples from disclosures of RIK utilization

In this Appendix, we include several disclosure examples of actual use of in-kind redemptions. When funds redeem their shares in kind and securities have built-in capital gains, gains are realized but not recognized for tax purposes. Gains are reclassified into paid-in capital and are reflected in the share appreciation, and thus increase future tax liabilities for non-redeeming shareholders. For example, T. Rowe Price Small-Cap Stock Fund discloses the following in its annual report as of December 31, 2007: "*Gains and losses realized on in-kind redemptions are not recognized for tax purposes and are reclassified from undistributed realized gain (loss) to paid-in capital*."[2] Sequoia Fund discloses that "During the year ended December 31, 2010 permanent differences primarily due to *realized gains on redemptions in kind not recognized for tax purposes*."[3] Vanguard Quantitative Funds Structured Large-Cap Equity Fund discloses that "During the six months ended March 31, 2009, the fund realized $20,147,000 of net capital losses resulting from in-kind redemptions—in which shareholders exchanged fund shares for securities held by the fund rather than for cash. Because such losses are not taxable losses to the fund, they have been *reclassified from accumulated net realized losses to paid-in capital*."[4]

Amounts of in-kind redemptions can be large in magnitude. Putnam Global Equity Fund discloses that for the year ended October 31, 2006, "the fund had redemptions in kind totaling $360,562,936" and out of the total net realized gain on investments of $356,448,373, $55,683,088 is from redemption in kind.[5] Sequoia Fund discloses that "The aggregate cost of purchases and the proceeds from the sales of securities, excluding U.S. government obligations, for the year ended December 31, 2010 were $567,738,908 and $757,968,488, respectively. Included in proceeds of

[2] https://www.sec.gov/Archives/edgar/data/75170/00000751700800003/arscs.htm.
[3] https://www.sec.gov/Archives/edgar/data/89043/000008904311000002/ncsr.txt.
[4] https://www.sec.gov/Archives/edgar/data/799127/000093247109001082/quantitativefundsfinal.htm.
[5] https://www.sec.gov/Archives/edgar/data/81251/000092881606001553/a_globequityfnd.htm.

sales is $52,896,079 representing the value of securities disposed of in payment of redemptions in-kind, resulting in realized gains of $42,755,343.[6] Prudential Strategic Partners International Value Fund discloses that "During the fiscal year ended October 31, 2005, shareholders redeemed fund shares in exchange for Series' portfolio securities valued at $148,897,793. The Fund realized a gain of $15,428,649 related to the in-kind redemption transactions. This gain is not taxable for Federal Income Tax purposes."[7]

[6] https://www.sec.gov/Archives/edgar/data/89043/000008904311000002/ncsr.txt.
[7] https://www.sec.gov/Archives/edgar/data/741350/000119312505250597/dncsr.htm.

Appendix F

Table A.F. Changes in funds' stock portfolio after RIK reservation

This table repeats the analyses in Columns (2) and (3) in Panel A of Table 6, by replacing the dummy variable capturing RIK usage (*useRIK*) with the dummy for RIK reservation (*RIK*), as well as all the interaction terms involved with *useRIK*.

Samples	Full flow<0	Full flow<−5%
	(1)	(2)
	change	*change*
flow×Amihud×RIK	−0.635	0.018
	(−0.57)	(0.01)
Controls	Yes	Yes
Fund and time FEs	Yes	Yes
Observations	5,627,024	1,735,837
Adj. R^2	0.039	0.053

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