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Redemption in Kind and Mutual Fund Liquidity Management

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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

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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. Under RIK, fund managers deliver a portfolio of securities in lieu of cash to redeeming investors. 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).

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.[1] For example, funds can deliver relatively illiquid securities to redeeming investors, who may incur substantial costs to liquidate such securities. Consequently, RIK should help discourage investor redemption and, in turn, alleviate strategic complementarities among investors. Third, facing investor redemption, fund managers

[1] 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.

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 current 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 redemption in kind 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. During 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 that RIK offers to funds such as mitigating both 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.[2] We find that the sensitivity of flows to poor performance reduces

[2] 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).

significantly when funds reserve RIK. A battery of robustness tests helps strengthen our identification and address potential selection issue in our analyses. These include (i) matching RIK funds with non-RIK funds on observable fund characteristics, (ii) exploiting an exogenous shock, namely the 2003 mutual fund trading scandal, to show that scandal-implicated RIK funds had significantly less outflows; (iii) documenting a stronger effect of RIK for illiquid funds; and (iv) showing the salience of investor awareness of RIK in mitigating run-like behavior.

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. 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). This suggests that funds resort to in-kind redemptions when they have large outflows.

We next document several novel findings that help explain 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), changes are non-proportional, with greater declines in funds' more liquid holdings. This finding suggests that 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 are more likely to stay invested due to less liquidation costs and strategic complementarities.

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 are 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 such transactions. We find that funds anticipate the selling pressure from redeeming investors and are more likely to completely sell or largely offload illiquid securities 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 are more likely to stay invested because RIK reduces fund's tax overhang, and alleviates strategic redemption motives aimed to avoid capital gains distribution.

Fourth, at the stock level, we find that stocks sold due to extreme investor outflows suffer from 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.

Finally, we examine the behavior of investor flows after RIK utilization. Offsetting several benefits of RIK, actual usage of RIK may alienate certain investors who value the liquidity transformation function of mutual funds and are unwilling to receive their redemptions in kind. We find that within RIK funds, those that "exercising the option" and utilize RIK indeed lose investor flows compared with control funds matched on all observable fund characteristics.

Recent literature highlights the importance of financial fragility in open-end mutual funds, and more broadly, in the shadow banking system.[3] Recognizing the economic implications of fragility on financial stability, a growing literature examines how funds can alleviate fragility.[4] 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. We show that RIK funds deliver relatively illiquid securities and transfer liquidation costs to redeeming investors. Consequently, redeeming investors lose liquidity transformation services and bear the costs of RIK by selling illiquid stocks on their own. In addition, RIK funds selectively deliver stocks with more unrealized capital gains, which reduces the tax burden on non-redeeming investors, incentivizing them to stay in the fund. To that extent, RIK can help open-end funds to counter the growing competition from exchange-traded funds (ETFs) that offer in-kind redemption between authorized participants and sponsors to avoid capital gains distribution for ETF investors.

[3] 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 can experience fragility (Agarwal, Aragon, and Shi, 2019; Aragon, Nanda, and Zhao, 2020).

[4] 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

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 may 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 itself to pay in cash). These redemption thresholds apply to each investor redemption, rather than the aggregate amount of redemption from all investors during the 90-day period.[5]

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 in-kind redemptions will be selected at the sole discretion of the funds and will not necessarily be representative of their entire portfolios.[6] 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).

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 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

[5] See https://www.law.cornell.edu/cfr/text/17/270.18f-1.

[6] 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).

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. However, 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. Benefits of such deferral can be substantial though. 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 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. 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 redemption in kind 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 bear the transaction cost of liquidating those securities themselves.

Second, if funds selectively deliver relatively illiquid securities in RIK transactions, it should further mitigate strategic complementarities. This is because redeeming investors 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; and Dammon and Spatt, 1996). This would also predict that RIK mitigates run-like behavior.

4. Data and variable construction

4.1 Mutual fund data

Our empirical analysis focuses on actively managed U.S. domestic equity funds from the Center for Research in Security Prices (CRSP) mutual fund database from 1997 to 2017. Our sample starts from 1997 because prior to 1992, filings of fund disclosure documents are not electronically available on SEC EDGAR, and from 1993 to 1996, the 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. We exclude index funds using the index flag provided in the database as well as by searching for "index" in fund names.

We also exclude funds with TNA less than $5 million to mitigate outliers when calculating percentage flows.

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:

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

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 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 this N-SAR data with the CRSP mutual fund data 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 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 they file Form N-18F-1. Second, for funds that have filed for the exemption before 1997, 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 their prospectuses for these keywords during our sample period. We then read these prospectuses and confirm that these funds indeed reserve their rights to redeem in kind, and label them as RIK funds. 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 shows that RIK funds constitute 66.5% of all fund-quarter observations. These figures suggest that RIK is widely used among open-end mutual funds and its popularity is increasing over time.

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.[7] 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 5.7%, which is 8.6% of the unconditional probability of being a RIK fund (66.5% as shown in Table 1, Panel B).

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. In Column (2), we add alternative liquidity management tools as controls to Equation (2). Our estimation results show insignificant coefficients on cash holding and borrowing, and a positive coefficient on interfund

[7] 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 estimates from the OLS regressions.

lending, indicating a complementary association between RIK and interfund lending. Finally, a positive relation between RIK and turnover is consistent with the notion that funds incurring significant transaction costs have more incentive to reserve RIK. Taken together, these findings indicate that RIK offers some distinctive benefits to funds for managing liquidity shocks, which we explore later in our analyses.

5.2 RIK and investor runs

5.2.1 Baseline results

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) along with the interaction between *age* and performance to account for stronger flow-performance response among younger, "hot money" funds (Spiegel and Zhang, 2013), while time-invariant fund characteristics such as *load* and *illiquid* are omitted due to the inclusion of fund fixed effects. As before, we control for quarter fixed effects and cluster standard errors at the fund level.

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 0.066, which is 39.5% less relative to the same sensitivity for funds without RIK (0.167). Columns (3) and (4) corroborate these findings using style-adjusted return and three-factor alpha as performance measures, where the sensitivities are reduced by 37.6% and 24.3%, respectively. Overall, these findings suggest that RIK funds suffer less from investor runs and capital fragility issues.

5.2.2 Potential selection issues

In this section, we address the potential concern that investors may self-select different types of funds to invest in and that such differences in fund characteristics may drive our results. First, the use of RIK may coincide with the use of other liquidity management tools. 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 investor clienteles with different horizons. For example, RIK funds may be less appealing to investors with short investment horizons since they may redeem more frequently and bear costs associated with in-kind redemptions.[8] Finally, Evans and Fahlenbrach (2012) document that institutional investors tend to monitor fund performance more closely and exhibit stronger flow-performance sensitivity.

[8] 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).

We match RIK funds with non-RIK funds on observable fund characteristics such as alternative liquidity tools, fund liquidity, institutional fund, and investment 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 matched sample, and again shows that RIK funds experience less outflows after poor performance compared with matched non-RIK funds.

In untabulated results, we find that our results are also robust after orthogonalizing RIK with respect to alternative factors that can affect the flow-performance sensitivity. We also repeat the flow-performance analysis for institutional and retail flows separately, and find our results hold in both subsamples. This suggests that the effect of RIK on flow-performance sensitivity is not confined to certain clientele.[9] Overall, the evidence in this section helps alleviate the potential concern that our finding is due to investors self-selecting into funds with different characteristics.

5.2.3 Illiquid 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 C of Table 3 shows the results based on the subsamples of liquid (*illiquid*=0) and illiquid (*illiquid*=1) funds. We

[9] We classify fund share classes into retail and institutional based on the methodology in Chen, Goldstein, and Jiang (2010). 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 find stronger evidence of RIK mitigating runs among illiquid funds. This finding is consistent with our results in Table 2 that illiquid funds are more likely to reserve their rights to use RIK.

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 C, 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 RIK funds with more views of their Form N-18F-1 experience even less redemption after poor performance.[10]

5.3 Exogenous shock to investor redemption

In this section, we exploit the 2003 mutual fund trading scandal as an exogenous shock to further test that RIK mitigates run-like behavior. As discussed in Anton and Polk (2014), this scandal resulted in a large amount of unexpected investor outflows from implicated funds, while unaffected funds continued to have investor inflows. The scandal was uncovered in September 2003, which we use as our event date. Following Anton and Polk (2014), we choose a post-event period of three years, and set the pre-event period to three years as well to implement a difference-in-differences regression of fund flows. Specifically, we define *scan* as an indicator variable that is equal to one if a fund belongs to a scandal-implicated family, and zero otherwise; and *post* as an indicator variable that is equal to one if the date is after September 2003, and zero otherwise.

[10] Arguably, institutions may be more aware of RIK compared with retail clients and institutional funds can also proxy for investor awareness. However, these funds exhibit much less run-like behavior to begin with due to a lesser concern of coordination problem (Chen, Goldstein, and Jiang, 2010).

Column (1) of Table 4 shows a negative and significant coefficient on the interaction term *scan*×*post*, indicating that investors redeem heavily from scandal-implicated funds after the shock. Implicated funds lost on average 2.2% of investor flows per quarter, an economically significant amount considering that the average quarterly flow was 1.7% for all funds during the 6-year period around the shock. In Column (2), we interact *RIK* with *scan*, *post*, and *scan*×*post*. The negative coefficient on *scan*×*post* shows that flows in scandal-implicated non-RIK funds decrease by 4.2% after the shock, while the positive and significant coefficient on *RIK*×*scan*×*post* suggests that RIK reduces the loss in flows for scandal-implicated funds by 2.8%.

We recognize that scandal-implicated funds can be different from the other funds. In Column (3), we use the subsample of scandal-implicated funds to further isolate the effect of RIK. We find that within scandal-implicated funds, RIK mitigates investor redemptions by 1.5% as indicated by a positive and significant coefficient on *RIK*×*post.* This result suggests that our inference is unlikely to be driven by the heterogeneity between scandal and non-scandal funds.

Finally, to ensure that our results are not driven by any difference in the pre-event trend of flows between RIK and non-RIK funds, in Columns (4) and (5) we match RIK funds with non-RIK funds (again using entropy balance matching) such that both groups have exactly the same pre-event flows. Reassuringly, the decline in net flows is much less for RIK funds after the scandal in both specifications. Overall, our results in this section show that RIK helps alleviate investor panic and mitigate fund runs after an exogenous event.

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. Note that we only observe one fund disclosure even if the fund delivers in-kind securities to multiple investors, or makes multiple deliveries to a single investor. In addition, we could not find any regulatory requirement for funds to disclose their RIK activities during our sample period, so we are likely to underestimate both the frequency and magnitude of actual use of RIK by funds.

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. Around one third of RIK disclosures also report dollar amounts of delivered securities. Although likely understated, 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 much larger compared with alternative liquidity management tools such as cash holdings and interfund lending. For example, the mean and median cash holding are only 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 D, we provide several examples of in-kind transactions from RIK disclosures.

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 any 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 increase the probability of RIK usage. Overall, funds are more likely to redeem in kind when they face large funding liquidity shocks.

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 D). 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 quarters 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 any 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.[11]

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, Column (3) shows 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.

[11] Our results are robust if we exclude fund fixed effects as in Lou (2012).

Interestingly, the coefficient on the triple interaction (3.987) is significantly larger than that on the double interaction *flow*×*Amihud* (−1.433). 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 Columns (4) and (5), 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 in Column (4), suggesting that funds sell relatively liquid securities after experiencing extreme funding liquidity shocks. Column (5) shows an even larger coefficient estimate on *flow*×*Amihud*×*useRIK* than in Column (3), 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 Panel B of Table 6, we replace *useRIK* with our indicator for RIK funds (*RIK*) and repeat our analyses in Columns (3) and (5) in Panel A. The triple interaction term *flow*×*Amihud*×*RIK* is actually negative, 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 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 C of Table 6, we examine cases when funds either completely or largely offload the stock positions. The dependent variable in the first two columns is an indicator variable *completeliq* that equals one if the fund completely sells off the position, and zero otherwise. The dependent variable in the last two columns is an indicator variable *largeliq* that equals one if the fund sells at least 80% of the position, and zero otherwise. We find a negative coefficient on *flow*, suggesting that greater outflows are more likely to trigger 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.[12]

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

[12] We do not find a positive coefficient on *flow*×*Amihud* in Panel C. We believe complete liquidation is different from the case of selling in general in Panel A. 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).

Karpoff and Lou (2010) and interact it with *flow*, *useRIK*, and *flow*×*useRIK*.[13] Panel D of Table 6 shows 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 Positions with built-in capital gains

In addition to delivering illiquid securities, another channel for RIK to mitigate runs is through the delivery of securities with built-in capital gains. In Panel E of Table 6, we examine the change in fund holdings for stocks with different levels of built-in capital gains. Column (1) shows a negative coefficient on *flow*×*cgstock*, suggesting that when funds face outflows, they are less likely to sell securities with 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, Column (2) shows a positive coefficient on the triple interaction *flow*×*cgstock*×*useRIK*, i.e., when funds utilize RIK, we observe a greater reduction in their stock positions with *more* built-in capital gains. Since Column (1) shows that in the absence of RIK utilization, funds have less incentive to sell securities with unrealized gains, results in Column (2) suggest 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, and in Columns (4) and (5) where we simultaneously control for the effect of stock liquidity on funds' selling behavior. Overall, results in this section are consistent with funds delivering stocks with more built-in capital gains to redeeming investors in RIK transactions.

[13] 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.

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:

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

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 even 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 less 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 calculate the price pressure induced by funds that utilize RIK and that do not, we further decompose *MFFlow* into the following two components:

$$\begin{aligned} MFFlow\_noRIK_{k,t} &= \sum_{j=1}^{n} \frac{F_{j,t} \times Shares_{k,j,t-1} \times PRC_{k,t-1}}{TA_{j,t-1} \times Vol_{k,t}} \left(1 - useRIK_{j,t}\right) \\ MFFlow\_useRIK_{k,t} &= \sum_{j=1}^{n} \frac{F_{j,t} \times Shares_{k,j,t-1} \times PRC_{k,t-1}}{TA_{j,t-1} \times Vol_{k,t}} \left(useRIK_{j,t}\right) \end{aligned} \tag{7}$$

where $useRIK_{j,t}$ is an indicator variable that is equal to one if fund *j* utilizes in-kind redemptions during the period, and zero otherwise. The sum of these two price pressure measures for funds with and without RIK utilization is equal to the total pressure measure, *MFFlow*.

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

$$CAR_{k,t} = \beta_1 + \beta_2 MFFlow\_useRIK_{k,t} + \beta_3 MFFlow\_noRIK_{k,t} + controls + \varepsilon_{i,t} \tag{8}$$

where $CAR_{k,t}$ 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.

We present estimation results in Column (1) of Table 8. The estimated coefficients on the two price pressure measures are both significantly 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 $MFFlow\_useRIK_{k,t}$ is significantly larger than that on

$MFFlow\_noRIK_{k,t}$, i.e., the price pressure generated by redeeming investors who receive in-kind redemption is much greater than 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 is correlated with stock return and volume, variations in return and volume may partly 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):

$$\begin{aligned} MFFlow\_noRIK_{k,t} &= \sum_{j=1}^{n} \frac{F_{j,t} \times Shares_{k,j,t-1} \times PRC_{k,t-1}}{TA_{j,t-1} \times Shrout_{k,t}} \left(1 - useRIK_{j,t}\right) \\ MFFlow\_useRIK_{k,t} &= \sum_{j=1}^{n} \frac{F_{j,t} \times Shares_{k,j,t-1} \times PRC_{k,t-1}}{TA_{j,t-1} \times Shrout_{k,t}} \left(useRIK_{j,t}\right) \end{aligned} \tag{9}$$

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. 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 create 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,

suggesting that non-redeeming shareholders bear little cost from the price pressure resulting from the trades of redeeming investors.

7. Investor flows after RIK Utilization

In the last part of our analysis, we examine whether RIK utilization may damage client relationship as certain investors may be less willing to invest in a fund if they value the fund's liquidity transformation services. Note that in Section 6.3, we show that RIK utilization mitigates the adverse impact of large outflows on fund performance, and better performance should attract more investor flows. To isolate the effect of RIK utilization on subsequent investor flows, we match funds that utilize RIK with a group of control funds based on their prior four quarters' performance and flows, as well as other observable fund characteristics. In addition, the control funds only include funds that reserve the option to use RIK. The idea here is to exploit the heterogeneity in the exercise of RIK option among all the funds that reserve this option. This also allows us to avoid potential selection issues between RIK and non-RIK funds as our analysis is confined to only RIK funds. Specifically, we estimate the following regression:

$$flow_{i,t+k} = \beta_1 + \beta_2 useRIK_{i,t} + controls + \varepsilon_{i,t+k} \quad (10)$$

where $flow_{i,t+k}$ denotes investor flow k quarters after RIK usage. Coefficient β_2 denotes the treatment effect of RIK usage in quarter t on subsequent investor flows in quarter $t+k$. When we analyze investor flows in quarter $t+k$, fund performance and flows of the treatment and controls are matched on a rolling basis up to quarter $t+k-1$. The matching results are omitted for brevity and are similar to the results in Table A.1 in the Appendix.

Figure 1 plots the estimated treatment effect β_2 over eight quarters after RIK usage, as well as the 90% confidence intervals. We find that within RIK funds, those that utilize RIK indeed lose investor flows compared with the matched controls. The treatment effects are statistically

significant up to 3 quarters after RIK usage, and the total effect amounts to 2.9% (=1.45%+0.76%+0.69%) of investor flows. This result suggests that *ceteris paribus*, investors view RIK usage as a negative signal that funds may cease to provide liquidity transformation services, and invest less in (or redeem more from) such funds.

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 after an exogenous negative shock from the 2003 mutual fund scandal. 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, to better manage capital gains distribution, and to mitigate the impact of outflows on fund performance. Offsetting these benefits accruing to non-redeeming investors, redeeming investors receive 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. Moreover, those RIK funds that choose to use it experience less flow subsequently because investors avoid such funds where they are unable to benefit from liquidity transformation function of funds.

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. In Panel B, *RIK* is an indicator variable that is equal to one if a fund reserves the right to redeem in kind, and zero otherwise. *flow* is quarterly net flow as a percentage of fund's TNA at the end of last quarter. *ret* and *sret* are net fund return and style-adjusted return, respectively. *size* is the logarithm of total net asset in millions of dollars. *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. *inst* is an indicator variable that is equal to one if at least 75% of a fund's asset is issued to institutions, and zero otherwise. *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. *lage* is the logarithm of the number of months since a fund's inception. *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. *ilp* is an indicator variable that is equal to 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.

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

	Mean	Std. Dev.	25%	50%	75%
RIK	0.665	0.472	0	1	1
flow	0.025	0.168	−0.041	−0.010	0.039
ret	0.021	0.093	−0.023	0.032	0.076
sret	0.000	0.036	−0.017	0.000	0.017
size	5.411	1.965	4.099	5.444	6.771
alpha3	−0.002	0.044	−0.022	−0.003	0.017
illiquid	0.299	0.458	0	0	1
inst	0.215	0.411	0	0	0
exp_ratio	0.013	0.005	0.010	0.012	0.015
turn_ratio	0.877	0.921	0.340	0.630	1.090
lage	4.564	1.022	4.043	4.787	5.347
borrow	0.285	0.185	0.250	0.250	0.250
ilp	0.184	0.388	0	0	0
%Cash	3.371	4.488	0.460	1.980	4.510

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 is set to one if a fund reserves its right to redeem in kind during the quarter, and zero otherwise. Independent variables are as defined earlier. 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*
illiquid	0.056***	0.059***
	(3.62)	(3.76)
size	0.021***	0.016***
	(4.78)	(3.49)
turn_ratio	0.020***	0.022***
	(3.24)	(3.44)
exp_ratio	−2.759*	−2.098
	(−1.70)	(−1.24)
lage	0.077***	0.085***
	(8.69)	(9.03)
load	0.024*	0.026*
	(1.75)	(1.83)
%cash		−0.001
		(−0.99)
ilp		0.084***
		(4.87)
borrow		−0.041
		(−1.51)
Time FEs	Yes	Yes
Observations	125,588	125,588
Adj. R^2	0.085	0.088

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 baseline results. Panel B reports the results using entropy-balance matched sample of RIK and non-RIK funds. Panel C reports results using subsamples of liquid and illiquid funds. Control variables in Panels B and C are the same as those in Panel A, and are omitted for brevity. 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: Baseline

Perf. measures	Raw Return	Raw Return	Style Return	3-factor Alpha
	(1)	(2)	(3)	(4)
	flow	*flow*	*flow*	*flow*
perfpos	0.149***	0.156***	0.104***	0.523***
	(11.85)	(7.51)	(3.81)	(6.91)
perfneg	0.119***	0.167***	0.181***	0.478***
	(9.68)	(8.77)	(10.06)	(10.60)
RIK×*perfpos*		−0.016	−0.008	0.045
		(−0.73)	(−0.30)	(0.57)
RIK×*perfneg*		−0.066***	−0.068***	−0.116**
		(−3.22)	(−3.41)	(−2.31)
RIK	−0.005*	−0.005*	−0.006**	−0.007**
	(−1.66)	(−1.68)	(−2.11)	(−2.21)
size	−0.025***	−0.025***	−0.025***	−0.023***
	(−24.83)	(−24.83)	(−24.81)	(−22.35)
lagflow	0.228***	0.228***	0.229***	0.221***
	(21.10)	(21.10)	(21.22)	(18.32)
turn_ratio	−0.001	−0.001	−0.001	−0.001
	(−1.09)	(−1.07)	(−1.05)	(−1.00)
exp_ratio	−1.440***	−1.438***	−1.417***	−1.353***
	(−3.91)	(−3.90)	(−3.84)	(−3.52)
%cash	0.001***	0.001***	0.001***	0.001***
	(9.44)	(9.44)	(9.42)	(9.44)
lage×*perf*	−0.000***	−0.000***	−0.000**	−0.001***
	(−5.05)	(−4.41)	(−2.57)	(−6.33)
lage	−0.042***	−0.042***	−0.042***	−0.036***
	(−17.64)	(−17.68)	(−17.64)	(−14.13)
Fund and time FEs	Yes	Yes	Yes	Yes
Observations	125,588	125,588	125,588	125,588
Adj. R^2	0.216	0.216	0.216	0.194

Panel B: Matched sample

Perf. measures	Raw Return	Style Return	3-factor Alpha
	(1)	(2)	(3)
	flow	*flow*	*flow*
perfpos	−0.018	−0.012	0.022
	(−0.90)	(−0.46)	(0.31)
perfneg	−0.048**	−0.050***	−0.109**
	(−2.44)	(−2.58)	(−2.01)
Controls	Yes	Yes	Yes
Fund and time FEs	Yes	Yes	Yes
Observations	125,588	125,588	125,588
Adj. R^2	0.169	0.168	0.173

Panel C: Liquid and illiquid funds

Perf. measures	Raw Return		Style Return		3-factor Alpha	
Samples	liquid	illiquid	liquid	illiquid	liquid	illiquid
	(1)	(2)	(3)	(4)	(5)	(6)
	flow	*flow*	*flow*	*flow*	*flow*	*flow*
RIK×*perfpos*	−0.071**	0.012	−0.059	0.020	−0.033	0.092
	(−1.99)	(0.44)	(−1.38)	(0.55)	(−0.23)	(0.99)
RIK×*perfneg*	−0.022	−0.090***	−0.029	−0.093***	−0.072	−0.151**
	(−0.69)	(−3.35)	(−0.91)	(−3.57)	(−0.83)	(−2.45)
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	79,341	37,783
Adj. R^2	0.244	0.208	0.244	0.208	0.227	0.184

Table 4. Investor redemption behavior around the 2003 mutual fund trading scandal

This table reports investor redemption behavior around the 2003 mutual fund trading scandal using fund-quarter observations. *scan* is an indicator variable that is equal to one if the fund belongs to a scandal-implicated family, and zero otherwise. *post* is an indicator variable that is equal to one if the date is after September 2003, and zero otherwise. "×" denotes interaction terms between corresponding variables. *scan* and *post* are omitted due to inclusion of fund and quarter fixed effects, respectively. Columns (1) through (3) show baseline results. Columns (4) and (5) show results from entropy balanced matching of RIK and non-RIK funds using pre-event flows. Columns (1), (2), and (4) report results for the entire sample, while Columns (3) and (5) report findings for the subsample of funds implicated in the scandal. 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.

	Baseline			Matched Sample	
Samples	All	All	Scandal	All	Scandal
	(1)	(2)	(3)	(4)	(5)
	flow	*flow*	*flow*	*flow*	*flow*
scan×post	−0.022***	−0.042***		−0.044***	
	(−3.87)	(−5.97)		(−5.57)	
RIK×scan×post		0.028***		0.030***	
		(3.30)		(3.21)	
RIK×post		0.005	0.015**	0.006	0.014*
		(1.42)	(2.18)	(1.62)	(1.93)
scan×RIK		−0.038**		−0.043**	
		(−2.48)		(−2.37)	
RIK		−0.000	−0.027**	−0.001	−0.032**
		(−0.00)	(−2.16)	(−0.14)	(−2.30)
performance		0.077**	0.048	0.078**	0.045
		(2.29)	(0.69)	(2.09)	(0.61)
size		−0.042***	−0.040***	−0.041***	−0.040***
		(−14.57)	(−7.38)	(−13.81)	(−7.23)
flow		0.223***	0.265***	0.225***	0.267***
		(18.46)	(9.86)	(17.76)	(10.05)
turn_ratio		0.001	0.004	0.001	0.003
		(0.43)	(0.88)	(0.28)	(0.84)
exp_ratio		1.140	−0.999	1.115	−1.149
		(1.32)	(−0.57)	(1.25)	(−0.65)
%cash		0.001***	0.002***	0.001***	0.002***
		(5.37)	(3.00)	(5.39)	(3.01)
lage×perf		−0.001	0.001	−0.001	0.002
		(−0.17)	(0.05)	(−0.18)	(0.10)
lage		−0.038***	−0.032**	−0.039***	−0.033**
		(−7.03)	(−2.23)	(−6.88)	(−2.28)
Fund and time FEs	Yes	Yes	Yes	Yes	Yes
Observations	41,083	40,084	7,638	40,084	7,638
Adj. R^2	0.243	0.338	0.360	0.358	0.386

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 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. Panel B replaces *useRIK* with *RIK* and repeats the analyses in Columns (3) and (5) of Panel A. In Panel C, Columns (1) and (2), the dependent variable *completeliq* is an indicator variable that is equal to one if the position is completely liquidated, and zero otherwise. In Columns (3) and (4), the dependent variable is *largeliq*, an indicator variable that is equal to one if the position is liquidated by at least 80%, and zero otherwise. In Panel D, *si* is the stock-level abnormal short interest measure. In Panel E, *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. Observations are at fund-stock-quarter level and standard errors are clustered at the fund level. *t*-statistics are reported in parentheses, and ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A

Samples	flow<0			flow<−5%	
	(1)	(2)	(3)	(4)	(5)
	change	*change*	*change*	*change*	*change*
flow	0.877***	0.884***	0.879***	0.895***	0.891***
	(38.47)	(40.19)	(38.61)	(31.80)	(30.60)
flow×Amihud		−1.378**	−1.433**	−1.289**	−1.461**
		(−2.53)	(−2.49)	(−2.26)	(−2.53)
flow×Amihud×useRIK			3.987**		9.439***
			(2.21)		(2.80)
Amihud		−0.059***	−0.060***	−0.040**	−0.047**
		(−3.49)	(−3.49)	(−2.05)	(−2.33)
Amihud×useRIK			0.065		0.379***
			(1.10)		(3.22)
flow×useRIK			0.083		0.105
			(1.19)		(1.07)
useRIK			−0.004		0.025
			(−0.66)		(1.61)
Fund and time FEs	Yes	Yes	Yes	Yes	Yes
Observations	6,406,800	6,282,763	6,282,763	1,971,656	1,971,656
Adj. R^2	0.039	0.039	0.039	0.051	0.052

Panel B

Samples	flow<0	flow<−5%
	(1)	(2)
	change	*change*
flow×*Amihud*×*RIK*	−1.840	−2.853*
	(−1.43)	(−1.73)
Controls	Yes	Yes
Fund and time FEs	Yes	Yes
Observations	6,282,763	1,971,656
Adj. R^2	0.018	0.0226

Panel C

Samples	flow<0	flow<−5%	flow<0	flow<−5%
	(1)	(2)	(3)	(4)
	completeliq	*completeliq*	*largeliq*	*largeliq*
flow	−0.115***	−0.102***	−0.166***	−0.168***
	(−6.95)	(−5.89)	(−8.73)	(−7.91)
flow×*Amihud*	−0.619*	−0.500	−0.242	−0.165
	(−1.78)	(−1.45)	(−0.65)	(−0.45)
flow×*Amihud*×*useRIK*	−3.102*	−4.422**	−3.926*	−5.717**
	(−1.81)	(−2.18)	(−1.88)	(−2.18)
Amihud	−0.009	−0.013	−0.004	−0.007
	(−0.78)	(−0.97)	(−0.31)	(−0.50)
Amihud×*useRIK*	−0.117*	−0.223***	−0.139**	−0.256***
	(−1.88)	(−3.00)	(−1.99)	(−2.79)
flow×*useRIK*	0.021	−0.005	0.039	0.038
	(0.40)	(−0.09)	(0.66)	(0.48)
useRIK	0.005	−0.004	0.006	−0.002
	(0.87)	(−0.37)	(1.04)	(−0.16)
Fund and time FEs	Yes	Yes	Yes	Yes
Observations	6,282,763	1,971,656	6,282,763	1,971,656
Adj. R^2	0.038	0.048	0.038	0.049

Panel D

Samples	flow<0	flow<−5%	flow<0	flow<−5%
	(1)	(2)	(3)	(4)
	change	*change*	*change*	*change*
flow	0.907***	0.900***	0.900***	0.893***
	(32.60)	(31.12)	(27.69)	(26.45)
flow×si	0.206*	0.222*	0.155	0.182
	(1.65)	(1.75)	(1.15)	(1.34)
flow×si×useRIK		−0.503		−0.689
		(−0.82)		(−1.08)
si	−0.002**	−0.002**	−0.003	−0.002
	(−2.00)	(−2.00)	(−1.50)	(−1.01)
si×useRIK		−0.001		−0.006
		(−0.42)		(−0.84)
flow×useRIK		0.122		0.194*
		(1.42)		(1.94)
useRIK		−0.007		0.035*
		(−0.69)		(1.68)
Fund and time FEs	Yes	Yes	Yes	Yes
Observations	4,230,741	4,230,741	1,342,572	1,342,572
Adj. R^2	0.045	0.045	0.064	0.064

Panel E

	flow<0	flow<0	flow<−5%	flow<0	flow<−5%
	(1)	(2)	(3)	(4)	(5)
	change	*change*	*change*	*change*	*change*
flow	0.816***	0.817***	0.835***	0.825***	0.841***
	(24.57)	(24.02)	(19.98)	(24.55)	(20.12)
flow×cgstock	−0.145**	−0.181***	−0.371***	−0.187***	−0.367***
	(−2.40)	(−3.24)	(−6.04)	(−3.31)	(−5.86)
flow×cgstock×useRIK		0.544**	0.491**	0.591**	0.544**
		(2.03)	(2.00)	(2.26)	(2.18)
cgstock	−0.420***	−0.430***	−0.469***	−0.421***	−0.458***
	(−36.25)	(−46.47)	(−37.51)	(−45.33)	(−36.09)
cgstock×useRIK		0.158***	0.135**	0.155***	0.129**
		(2.61)	(2.39)	(2.63)	(2.24)
flow×Amihud				−3.130***	−3.773***
				(−3.40)	(−3.96)
Amihud				−0.077***	−0.061**
				(−5.17)	(−2.39)
flow×Amihud×useRIK				8.507*	14.178***
				(1.87)	(2.87)
Amihud×useRIK				0.036	0.109
				(0.54)	(1.12)
flow×useRIK		0.031	−0.017	−0.010	−0.075
		(0.37)	(−0.18)	(−0.11)	(−0.77)
useRIK		−0.021*	−0.017	−0.020*	−0.015
		(−1.85)	(−0.92)	(−1.77)	(−0.79)
Fund and time FEs	Yes	Yes	Yes	Yes	Yes
Observations	5,722,593	5,722,593	1,765,540	5,627,024	1,735,837
Adj. R^2	0.058	0.058	0.089	0.058	0.089

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. *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

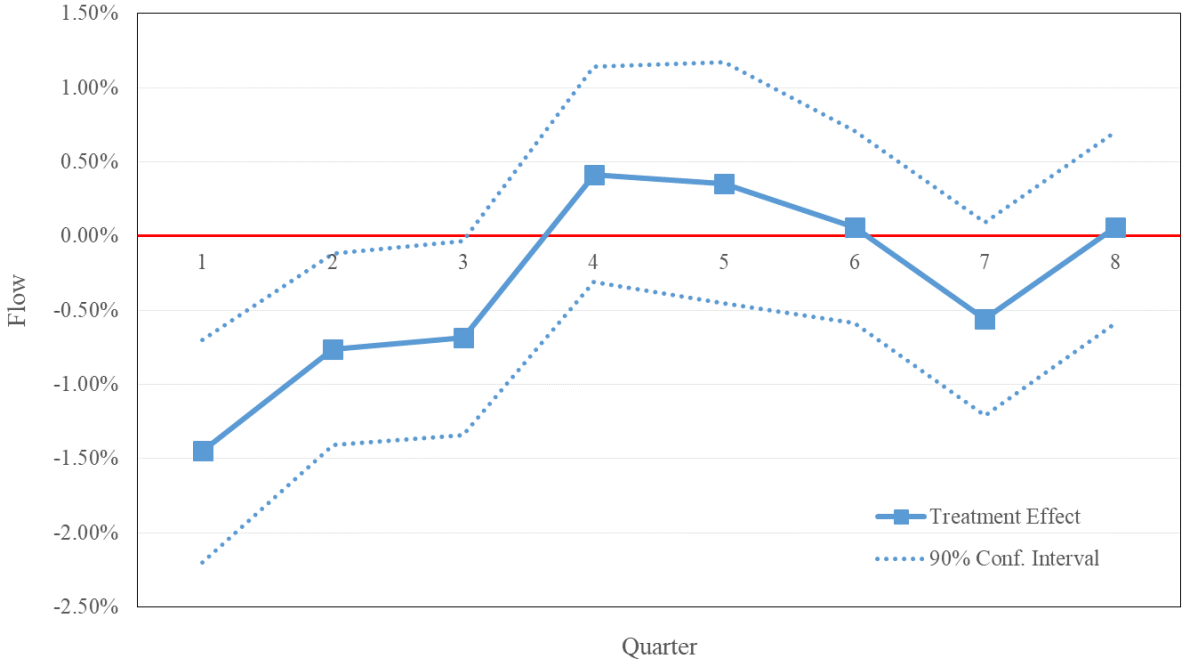
Table 8. Effects of RIK utilization on price pressure

This table reports estimation results of price pressure analysis conditional on large investor outflows in Equation (8). 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_noRIK* is the stock-level price pressure measure generated by funds that do not utilize in-kind redemptions during a given quarter. *MFFlow_useRIK* is the price pressure generated by funds that utilize in-kind redemptions during a given quarter. In Column (1), price pressure measures (*MFFlow_noRIK* and *MFFlow_useRIK*) are computed as in Equation (7) following EGJ (Edmans, Goldstein, and Jiang, 2012). In Column (2), price pressure measures are scaled by total shares outstanding of a stock as suggested by Wardlaw (2020) and defined in Equation (9). Observations are at the stock-quarter level and standard errors are clustered at the stock level. *t*-statistics are reported in parentheses, and ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Pressure Measures	EGJ	ShareOut
	(1)	(2)
	CAR	*CAR*
MFFlow_noRIK	−0.189***	−0.155***
	(−5.96)	(−4.64)
MFFlow_useRIK	−0.507**	−0.486**
	(−2.14)	(−2.02)
Time FEs	Yes	Yes
Observations	295,416	295,416
Adj. R^2	0.028	0.028

Figure 1. Investor flows after RIK utilization

This figure plots the treatment effect of RIK utilization on subsequent fund flows estimated from Equation (10). The treatment effects are estimated by matching funds that utilize RIK with a group of control funds based on their prior four quarters' performance and flows, as well as other observable fund characteristics. The control funds only include funds that reserve the option to use RIK. The x-axis denotes the number of quarters after RIK utilization, and y-axis denotes fund flows in percentage. Dots on the solid line denotes the estimated treatment effects, and the dotted lines denote 90% confidence intervals.



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.1 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.1: 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
backload	0.685	0.685
flow	0.008	0.008
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
inst	0.211	0.211
duration	9.619	9.619

Appendix C: 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.[2] Table A.2 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.

[2] 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.2 (as we do for all the previous flow-performance analyses in Table 3).

Table A.2 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 clustered at the fund level and *t*-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Perf. measures	Raw Return	Style Return	3-factor Alpha
	(1)	(2)	(3)
	flow	*flow*	*flow*
Highview×*perfpos*	0.094*	0.054	0.187
	(1.92)	(0.84)	(1.29)
Highview×*perfneg*	−0.168***	−0.101*	−0.271**
	(−3.10)	(−1.90)	(−2.09)
Highview	−0.001	0.002	−0.001
	(−0.32)	(0.40)	(−0.32)
Controls	Yes	Yes	Yes
Fund and time FEs	Yes	Yes	Yes
Observations	83,516	83,516	83,516
Adj. R^2	0.259	0.258	0.257

Appendix D: 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*."[3] 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*."[4] 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*."[5]

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.[6] 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

[3] https://www.sec.gov/Archives/edgar/data/75170/000007517008000003/arscs.htm.
[4] https://www.sec.gov/Archives/edgar/data/89043/000008904311000002/ncsr.txt.
[5] https://www.sec.gov/Archives/edgar/data/799127/000093247109001082/quantitativefundsfinal.htm.
[6] 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.[7] 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."[8]

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

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