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Mutual Fund Redemptions in Kind

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BY

Honglin Ren

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree

Of

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ACCEPTANCE

This dissertation was prepared under the direction of the Honglin Ren Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Business Administration in the J. Mack Robinson College of Business of Georgia State University.

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ABSTRACT

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Open-end mutual funds can use redemptions in kind to meet investor redemption requests by delivering securities held by the fund in lieu of cash. Such a tool can mitigate the need of asset fire sales while passing associated liquidation costs to the redeeming investor. Greater asset illiquidity, greater flow volatility, and younger funds are associated with a higher likelihood of funds utilizing redemptions in kind. Investors in illiquid funds with a greater likelihood of using redemptions in kind exhibit less run-like behavior. Redemptions in kind helps reduce the adverse effect of flow-induced pressure on stock performance and improve fund performance subsequent to extreme investor redemptions. Offsetting these benefits, redemptions in kind also reduces investors' flow sensitivity to good performance. I find further evidence suggesting that, when redeeming in kind, funds deliver illiquid securities during periods when the market is illiquid and volatile.

JEL classification: G18, G23

Keywords: redemptions in kind, mutual funds, liquidity management, asset illiquidity

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Honglin Ren[1]

July 2019

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[1] Ren is from J. Mack Robinson College of Business, Georgia State University, hren1@gsu.edu. I benefited from the comments received from Vikas Agarwal, Jeffrey M. Colon, Gerald Gay, Wei Jiang, Kevin A. Mullally, Zhen Shi, Erik Sirri, Haibei Zhao, and presentations at the FMA Doctoral Student Consortium, Georgia State University, The University of Kansas, Lehigh University, Northeastern University, Peking University HSBC Business School.

1. Introduction

In their pursuit of superior performance, open-end mutual fund managers undertake a variety of investment strategies that differ in terms of time horizon and asset mix. The success of such strategies though is susceptible in varying degrees to potential mismatch in the liquidity of assets and the liquidity of liabilities. Liability liquidity in this context is the investors' ability to redeem fund shares on a daily basis at the day-ending net asset value (NAV). If these withdrawals are sufficiently large and unanticipated, they have the potential to disrupt funds' operation forward, especially when fund managers invest in relatively illiquid assets. This, in turn, can impose a negative externality on investors that choose to stay in the fund. Managers utilize a number of means to address this type of liquidity risk including the use of cash holdings (Yan, 2006; Simutin, 2014), borrowing internally within the family through interfund lending (Agarwal and Zhao, 2018), and borrowing externally from banks. This study contributes to this literature by focus on another mechanism — redemptions in kind (henceforth "RIK") wherein managers may elect to deliver securities held by the funds to redeeming investors in lieu of cash.

By avoiding the need for asset sales, RIK mitigates the motivation for investor redemptions in expectation of others' withdrawals. Such mechanism helps prevent fund runs. However, RIK passes liquidity costs associated with redemptions to redeeming investors, which could discourage investors' demand for fund shares.[2] Moreover, when funds have the discretion over which securities to deliver in RIK, it might create a potential conflict of interest between fund manager and investors, amplifying the cost of implementing RIK.

[2] Invesco Advisers, Inc., in its comment letter, states that "the primary problem with using redemptions in kind to meet large redemptions is the willingness and ability of the redeeming entity to receive securities instead of cash". https://www.sec.gov/comments/s7-16-15/s71615-75.pdf.

In this study, I investigate the motivations and consequences of RIK in managing mutual funds' liquidity risks. To start with, I identify funds with greater likelihood of utilizing RIK to conduct ex-ante analysis. I first examine what fund characteristics are associated with funds' choices in having RIK along with alternative liquidity management tools including cash and borrowing using the Seemingly Uncorrelated Regression (SUR) approach. Then I investigate how RIK affects investors' investment and redemption behaviors. Next, I directly test, conditional on a large outflow, whether RIK helps reduce the price impact on the stocks held by funds and improve funds' performance. In the later part of the paper, I identify actual RIK uses to shed light on how frequent RIK takes places and the magnitude of RIK transactions. Furthermore, I investigate funds' choices in what types of securities to deliver in RIK.

Section 18(f)(1) of the Investment Company Act of 1940 and Rule 18f-1 control RIK. Under Section 18(f)(1), technically, if a fund uses RIK, it must be applied to all redeeming investors and with proportional shares taken from all underlying portfolio holdings.[3] That is, all redeeming investors will receive a similar basket of shares mirroring the fund holdings. As such, this requirement limits a fund's flexibility in utilizing RIK, which makes its use less operational feasible. Rule 18f-1, adopted in 1971, provides exemptions from this requirement of the Section 18(f)(1). Specifically, it allows a fund apply RIK to redemptions that are either over $250,000 or 1 percent of the NAV during any 90-day period with the selection of securities at funds' discretion. However, for redemptions less than the aforementioned specified amount, the fund commits itself to pay in cash. Investment companies who would like to have this option can file the exemption

[3] Section 18f-1: "it shall be unlawful for any registered open-end company to issue any class of senior security or to sell any senior security of which it is the issuer…" Michael S. Piwowar, the SEC then commissioner, made this following statement at the 2015 ICI mutual fund conference: " however, an agreement by a fund to make payments to some shareholders in a manner different from payments to other shareholders, for example cash only rather than cash or in-kind, would be deemed to create a class of senior securities prohibited by Section 18f-1 of the Investment Company Act."

with SEC under Rule 18f-1, and such practice is applied to all the funds managed by the investment company. Such election is irrevocable while the exemption is in effect.

Taken together, this Rule 18f-1 provides funds greater flexibility to treat large and small redemptions differently and distribute specific securities at its discretion, making RIK more operational feasible for the fund. I exploit the filing of Form 18f-1 to conduct ex-ante analysis on motivations and consequences of RIK. I identify those funds who file for this exemption under rule 18f-1 as the ones with greater likelihood to use RIK compared to the other funds.

Tax treatment of RIK is unique and complex that can be summarized as follows (see Colon (2017) for a more detailed discussion). With RIK, at the fund level, the fund does not recognize any gain or loss. If the distributed securities are associated with unrealized gains, §852(b)(6) applies, which exempts registered investment companies from gain recognition for RIK.[4] Alternatively, the law states that a fund can avoid recognizing taxable gains on an appreciated stock with RIK. The capital gain associated with the stocks used in RIK is not realized at the time of in-kind redemptions. However, this part of capital gain is still reflected in the appreciation in the price of fund share. Essentially, investors remaining in the fund get to delay taxes until they sell the fund shares.[5] If the distributed securities are associated with unrealized losses, they are covered by §311(a) and no loss is recognized.[6] At the redeeming shareholders' level, it is less clear. An article published in the Wall Street Journal in 1999, "'Redemptions in Kind' Become Effective for Tax Management"[7] mentions: "For investors redeeming fund shares, the tax hit is the same

[4] See https://www.law.cornell.edu/uscode/text/26/852.
[5] "Vanguard Patented a Way to Avoid Taxes on Mutual Funds", https://www.bloomberg.com/graphics/2019-vanguard-mutual-fund-tax-dodge/. "The main benefit of avoiding taxable gains in a mutual fund is tax deferral. Funds distribute their taxable gains to investors, who pay income taxes on them in the same year. By avoiding tax events within the fund, investors get to delay taxes until they sell the fund, which could be years or decades later. It's akin to a zero-interest loan from the IRS."
[6] See https://www.law.cornell.edu/uscode/text/26/311.
[7] https://www.wsj.com/articles/SB921028092685519084.

whether the fund distributes cash or securities. Fund investors owe tax on the difference between what they paid for their fund shares and the proceeds they received, whether in securities or cash, says Robert Willens, tax and accounting analyst at Lehman Brothers." In Appendix B, I provide an example to further illustrate the effect of RIK on taxes. In this dissertation, I focus on the liquidity management perspective of RIK and leave out the role of taxes for future research.

I start with modeling the choices of liquidity management tools simultaneously using SUR approach and find that asset illiquidity at both the investment company and the fund levels are positively related to the likelihood of a funds' utilizing RIK. Specifically, a fund company is more likely to apply for this exemption when the company manages more bond and/or balanced funds rather than equity funds. One standard deviation increase in the percentage of number of equity funds managed by the investment company decreases the unconditional probability of filling for RIK exemption by 2.85%. Similarly, a fund investing in comparatively more illiquid assets is associated with a higher propensity of filing for this exemption. Being an illiquid fund increases the unconditional probability of filling for RIK exemption by 10.5%. These results are consistent with the view that the need for liquidity management is greater for funds with more illiquid assets. Under this SUR framework, I further find that some common fund characteristics, such as flow volatility, fund age, and expense ratio, are positively associated with the use of multiple liquidity management tools. These observations suggest that certain common features of the fund, such as asset illiquidity, exotic fund strategy, and/or less predictable capital flows drive the use of all types of liquidity management tools. In addition, I observe a positive correlation in the residuals between RIK and the other liquidity management tools. I interpret these results as suggesting that RIK complements the other means of liquidity management tools such as holding cash and borrowing.

Next, I examine investors' purchase and redemption behavior to further understand the benefits and costs associated with RIK to a fund. To a fund investor, the benefit of investing in a fund with RIK comes from the reduced costs associated with liquidity externality from other investors' redemptions. This feature of RIK predicts a lower flow to performance sensitivity when funds perform poorly, which effect shall be stronger for funds investing in more illiquid assets. On the other hand, the cost to an investor is that when she redeems, there is a probability of receiving securities rather than cash from the fund. On top of that, with the exemption obtained under the Rule 18f-1, the manager decides on the basket of securities an investor receives. When an investor makes decisions on which funds to invest in, she takes into account both the benefits and costs associated with RIK. Empirically, we only observe the net effect from investors' purchase decision.

In the overall sample, when funds have a negative performance, I don't find a significant difference in flow-performance sensitivity between funds with RIK and funds without. However, in the subsample of illiquid funds, RIK reduces the sensitivity of outflows to poor performance by 24%. This finding suggests that RIK helps reduce investors' run-like behavior, but only for funds investing in more illiquid assets. In the positive performance regime, I find that filing for the exemption reduces flow-performance sensitivity. This finding suggests that investors do concern about the likelihood of receiving a basket of securities, which deters their investments in a fund with higher likelihood of utilizing RIK. Since we observe that different fund characteristics are associated with these two groups of funds, I conduct a matched sample analysis where I match the funds with RIK and without on observable fund and family characteristics. The results still hold.

I then investigate, conditional on large outflows, whether RIK helps mitigate the price impacts due to asset fire sales by funds. Using the methodology developed in Edmans, Goldstein, and Jiang (2012), for each stock-quarter, I construct hypothetical sales pressure from mutual fund fire sales

and decompose it into two components, sales pressure from funds with RIK exemption and sales pressure from funds without the exemption. I find that the quarterly cumulative abnormal return (CAR) for the underlying stocks held by funds that have filed for the exemption are much smaller compared to the CARs of stocks held by funds that have not applied for exemption. This finding supports that RIK helps mitigate the asset sale costs associated with large outflows. I also compare fund performance conditional on a large outflow for funds with exemption to the performance of funds without the exemption that experience similar outflows. I find weak evidence that RIK helps mitigate the negative effect of large outflows on performance.

To further understand the economic magnitude of RIK transactions and whether funds pick particular types of securities to deliver, I identify actual RIK utilizations from funds' semi-annual financial statements. For fiscal years ending in 2004 to 2012, there are 713 RIK disclosures for 385 funds. That is, around 12.8% of funds in the sample has used RIK during this period. I observe that funds use RIK throughout all the years and different market conditions. The year 2008 has the largest number of disclosures (118), suggesting that RIK is more likely to be used during the time when the market liquidity is low and has a poor prospect. Overall, RIK transactions at the aggregated semi-annual level are economically large, with mean and median dollar amount as $119 million and $61 million, respectively. In terms of percentage of fund's TNA, the mean and median are 16% and 6%. Following Lou (2012), I model funds' portfolio churning behavior in response to net capital outflows using quarterly holdings data. I find that fund managers strategically pick stocks that are illiquid to deliver during time periods when the market is illiquid and volatile (2007-2012). Such pattern is not observed during the years when market is performing well and liquid (2004-2006).

This paper contributes to the liquidity management literature in the mutual fund industry (e.g., Chordia, 1996; Nanda et al., 2000; Yan, 2006; Goncalves-Pinto and Schmidt, 2013; Simutin, 2014; Chernenko and Sunderam, 2016; Agarwal and Zhao, 2018; Nanda and Wei, 2018). Funds utilize various means to manage liquidity risks. The fact that we observe funds using different ones at different times suggests that there are benefits and costs associated with each type of liquidity management tool depending on the nature of the liquidity shocks, the funds' conditions, as well as the market condition. My study adds to this literature by providing insights on RIK, one liquidity management tool can be utilized by mutual funds.[8]

This study is also related to the literature on fund fragility such as Chen, Goldstein, and Jiang (2010) and Zeng (2018) for mutual funds, Liu and Mello (2011) for hedge funds, and Kacperczyk and Schnabl (2013), and Schmidt, Timmermann, and Wermers (2016) for money market funds. Such complementarities are in the spirit of the bank-run literature going back to Diamond and Dybvig (1983). This issue is of first-order importance given recent evidence showing that financial fragility in the asset management industry can result in externalities from prices to real economy (Edmans, Goldstein, and Jiang, 2012; Khan, Kogan, and Serafeim, 2012; Hau and Lai, 2013). In this study, I show that, for illiquid funds, with the flexibility of implementing RIK to reduce the negative externalities, investors' flows are less responsive to past poor performance. Furthermore, this study builds on asset fire sales literature (e.g., Shleifer and Vishny, 1992, 1997; Coval and Stafford, 2007; Ellul, Jotikasthira, and Lundblad, 2011) and shows that RIK helps reduce the flow-induced selling pressure on underlying assets held by the funds.

[8] A similar tool can be utilized by funds is redemption restrictions. Under Rule 22e of the Investment Company Act, an open-end mutual fund is prohibited from suspending the right of redemption or postponing the payment of redemptions for more than seven days. The SEC has the right to deem emergency periods during which a fund is able to suspend redemptions. However, the fund needs to apply to the SEC at the time and obtain the approval, which may take some time and the final decision is not at the fund's discretion.

This paper proceeds as follows. Section 2 describes the sample and variables construction. Section 3 investigates what characteristics are associated with higher likelihood of using RIK. Section 4 investigates consequences of a higher likelihood of using RIK, including the effects on flow-performance sensitivity, price impact from asset fire sales, and fund performance conditional on large outflows. Section 5 provides ex-post analysis on actual RIK disclosures and Section 6 concludes.

2. Sample and variable construction

The empirical analysis focuses on 2,966 actively managed equity funds from the Center for Research in Securities Prices Mutual Fund (CRSPMF) database between years 2006 and 2015. I use two parts of data to construct the final dataset. First, to obtain information on RIK, I search through related filings on SEC Edgar database. Second, I obtain fund characteristics and return information from the CRSPMF database. I merge these two parts of data primarily relying on fund ticker and name. Since the SEC Form N-SAR provides fund name along with fund ticker since 2006, for the accuracy of matching, my sample starts in year 2006. More details of the sample and variables constructions are in the following subsections.

2.1 RIK exemption data

Investment companies must file Form N-18F-1 to SEC to obtain the exemptive relief provided by Rule 18f-1.[9] Information on which fund companies have filed for this form comes from two types of SEC filings. First, I search through the SEC Edgar and obtain all Form N-18f-1. Since year 1994 is the first year when SEC filings are available electronically through the EDGAR database, this process provides all the fund companies who have opted in this exemption under rule 18f-1 since year 1994. Second, for the fund companies who have filed for this exemption

[9] The Form N-18F-1 has a standard format: https://www.sec.gov/files/formn-18f-1.pdf.

before 1994, I take a different approach. Redemptions related information are required to be disclosed in fund prospectus and statement of additional information. Thus, I search through 485 filings on SEC Edgar for these fund companies. In the filling, if a fund company discloses information such as, 1) the fund has elected to be governed by Rule 18f-1, or 2) the fund is obligated to redeem its shares solely in cash up to the lesser of $250,000 or 1% of its NAV during any 90-day period, I mark the fund company as having elected to be governed by Rule 18f-1 before year 1994, otherwise not.

Examples of disclosures on RIK in the prospectus are as follows. Sentinel Group Funds, Inc. files Form N-18f-1 on the 10th of October, 2008. In its 2009 March prospectus, Sentinel Group Funds, Inc. writes "shares normally will be redeemed for cash upon receipt of a request in proper form, although each of the Funds retain the right to redeem some or all of its shares in-kind under unusual circumstances, in order to protect the interest of remaining shareholders, by delivery of securities selected from the Fund's assets at its discretion… The Funds have elected, however, to be governed by Rule 18f-1 under the Investment Company Act so that each Fund is obligated to redeem its shares solely in cash up to the lesser of $250,000 or 1% of its net asset value during any 90-day period for any one shareholder of the Fund." Furthermore, in its 2008 prospectus, there is no disclosure about RIK. Another example is from Lord Abbett Affiliated Fund Inc. In their 2011 February prospectus, it writes "under circumstances in which it is deemed detrimental to the best interests of the Fund's shareholders to make redemption payments wholly in cash, the Fund may pay any portion of a redemption in excess of the lesser of $250,000 or 1% of the Fund's net assets by a distribution in kind of readily marketable securities in lieu of cash."

2.2 Mutual fund sample and variables construction

I construct my sample of actively managed equity mutual funds from the CRSPMF database over the years from 2006 to 2015. Following Chen, Goldstein, and Jiang (2010), I include international equity funds in my sample to add more diversity in liquidity. Mutual fund data are at share class level. I aggregate variables, such as return, fees, turnover ratio to the fund level by value-weighting based on share class total net asset (TNA). I calculate fund level TNA as the sum of the share classes' TNA. Fund age is the age of the longest existing share class. Fund style is the style of the largest share class. A fund is considered as a load fund if any of its share classes has a front- or end-load at a given point of time. A fund is considered as an institutional-oriented fund when 75% of a fund's assets are in institutional share classes. At the share class level, CRSPMF assigns each fund share a dummy for institutional share and a dummy for retail share. The two dummies, however, are not mutually exclusive. Following Chen, Goldstein, and Jiang (2010), I consider a share class to be an institutional share class if the CRSPMF institutional share dummy is one and the CRSPMF retail share dummy is zero.

A fund is defined as an equity fund if it is categorized as an equity fund by the CRSPMF style code[10] (CRSPMF style code starting with letter "E") for more than 90% of the time throughout the sample period. I exclude index funds using the index flag provided in the database as well as by searching for the word "index" in the fund name. I further exclude fund-month observations with TNA less than $5million, as in Fama and French (2010), to mitigate incubation bias (Evans, 2010).

Fund flows are estimated as the net three-month flows for each fund using its corresponding return and TNA as follows:

$$Flow_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-3}(1+\mathrm{Re}t_{i,t})}{TNA_{i,t-3}}$$

[10] Information on CRSPMF Style Code can be found at http://www.crsp.com/products/documentation/crsp-style-code.

Where *t* denotes the month and *i* denotes the fund. To measure fund performance, I estimate monthly out-of-sample alphas from different multi-factor models using the past 24-month net-of-fee returns. Specifically, I use the CAPM model, Fama and French 3-factor model, and the Carhart 4-factor model. Then quarterly performance is the compounded three-month alphas.

Following Chen, Goldstein, and Jiang (2010), I create a dummy variable *Illiquid* to capture the illiquidity of a fund's underlying assets using CRSPMF Standard & Poor's style code. Specifically, *Illiquid* equals one if these codes indicate that the fund invests primarily in one of the following categories: micro-cap equities (domestic or international), small-cap equities (domestic or international), mid-cap equities (domestic or international), or single-country assets excluding US, UK, Japan, and Canada. This definition has the advantage that it captures a fund feature which is transparent to all investors. Besides, this measure is exogenous to fund flows because this is the stated objective at the inception of the fund.

Finally, mutual fund portfolio holdings data comes from Thomson Reuters S12 database. I merge the CRSP mutual fund database with the Thomson Reuters holdings database using MFLINKS file based on Wermers (2000) and available through the Wharton Research Data Services (WRDS). I clean up the dataset following Kacperczyk, Sialm, and Zheng (2008). I also exclude funds when <75% of the underlying securities are matched to the CRSP database.

2.3 Data items collected from Form N-SAR and matching with the CRSPMF database

Registered investment companies are required by the SEC to file the Form N-SAR twice a year. Using a python program, I obtain various important information from the N-SAR form and construct the following variables. First, I obtain basic filing information including Central Index Key (CIK), fund series name, fund series ticker, and filing date. Second, I obtain funds' constraints on the use of borrowing from Question 70 (see Almazan et al., 2004 for more details on the

discussion of restrictions) and the actual use of overdraft or bank loan from Question 55. Questions 55A and 55B asks whether a fund borrows in excess of 1% of their assets either through an overdraft or a bank loan during the reporting period, respectively. Third, I obtain end-of-filing period TNA (Question 74T) for all funds (including equity, bond, and balanced funds) in the investment company to compute family size. The identifiers for equity, bond, and balanced funds are from Questions 62A, 66A, and 67. Using this information, I further compute the percentage of company assets in equity funds and the percentage of number of equity funds in the investment company.

To merge the data extracted from the SEC Edgar database and the CRSPMF database, I first use the ticker-year information from NSAR filings and the CRSPMF database to obtain a matched sample. After that, I verify each matched pair by comparing end-of-filing period TNA to the TNA reported in the CRSPMF database using the following two steps. First, I keep the match where the difference between these two TNAs to be less than 1% for any given point of time. Second, I require the correlation between the two time-series of TNAs for a given fund to be greater than 98%. The final matched sample yields a total of 2966 equity funds. The Appendix Table A.1 provides comparisons between the matched sample and the CRSPMF-only sample by year. The average matching rate from 2006 to 2015 is 80%, which is comparable to the rate reported in the Table A.1 of Natter, Rohleder, Schulte, and Wilkens (2016) for the same period. Furthermore, the table shows there is no significant deviations of the matched CRSPMF/NSAR sample from the CRSPMF-only sample with respect to fund major characteristics.

2.4 Other data

Stock return and trading information is obtained from the CRSP monthly stock file. To address potential microstructure issues, I exclude all stocks whose price is below five dollars a share. At

the stock level, I use the Amihud illiquidity measure developed in Amihud (2002) to capture the underlying stock's liquidity. In addition, I obtain firm-level accounting data and short interest data from Compustat and I match this data to financial market data from CRSP using the CRSP/Compustat merge file. I calculate book equity as the total shareholder equity minus the book value of preferred stock plus the book value of deferred taxes and investment tax credit.

2.5 Summary statistics

Table 1 reports the summary statistics of the sample. To mitigate the influence of outliers, all variables, except dummy variables, are winsorized at the 1% and 99% level. Panel A provides information on the distribution of funds with and without exemption for RIK under Rule 18f-1. Among the 2966 funds in the sample, 2087 (70%) funds have this exemption starting from the beginning of the sample period 2006, 759 (26%) funds don't have this exemption throughout the sample period from 2006 and 2015, and the rest 120 (4%) funds filed for the exemption during the sample period from 2006 and 2015. Panel B provides summary statistics for fund-month observations from 2006 to 2015. The definitions of all variables are reported in Appendix Table A.2. Fund-month wise, 71.7% of observations are from funds with exemption for RIK. The average investment company size is $14,182 million, with a median of $5,296 million. The percentage of equity funds in the company is 84.7% measured in dollar term or 86% measured in number of funds. Furthermore, the majority of funds is allowed to borrow externally (86.3%) or investing in restricted securities (94.5%). The actual utilization of overdraft or bank loan is 28.8%. Other variables such as fund flows, expense ratio, turnover ratio, illiquid fund, and institutional-oriented fund are similar in magnitude to those reported in the extant literature.

3. Characteristics associated with funds filling for the exemption of RIK

I start to examine the incentives with having RIK as an option to manage funds' liquidity risk and the relations between RIK and other liquidity management tools. It is reasonable to assume that the decisions on liquidity management, including how many means to utilize and which ones, are determined jointly. Therefore, I model the choices of having different liquidity management tools simultaneously and account for the correlations in the residuals under a SUR approach. For liquidity management tools, I include RIK, along with two alternative types of liquidity management, holding cash and borrowing externally.

For explanatory variables, I consider both asset liquidity and fund characteristics that have been shown to be associated with level of liquidity management in the literature. Previous studies (Edelen, 1999; Johnson, 2004; Alexander, Cici, and Gibson, 2007; and Coval and Stafford, 2007) document that, substantial redemptions requests can affect fund trading going forward, which are costly to remaining shareholders. Costs include explicit transaction costs such as commissions and bid-ask spread or implicit costs including price impacts and deviations from desired portfolios. These costs are especially large if funds hold illiquid securities that are critical to a fund's investment strategy. Later, Chen, Goldstein, and Jiang (2010) and Goldstein, Jiang, and Ng (2017) show that funds holding more illiquid asset are subject to stronger complementarities among investors due to above reasons. Therefore, illiquid funds have a greater need for liquidity management. Specifically, I consider asset liquidity at both the investment company and fund levels. At the investment company level, I measure the overall asset liquidity using percentage of number of equity funds within a company (*% equity funds*). At the fund level, following Chen, Goldstein, and Jiang (2010), I construct a dummy variable *Illiquid* to capture the illiquidity of a fund's underlying assets using the CRSPMF Standard & Poor's style code. Specifically, *Illiquid* equals one if these codes indicate that the fund invests primarily in one of the following categories:

micro-cap, small-cap, mid-cap equities (domestic or international), or single-country assets excluding US, UK, Japan, and Canada. For fund characteristics, I include investment company size, fund size, load fees, standard deviation of flows, turnover ratio, expense ratio, fund age, and institutional-oriented funds.

Since some of the variables are constructed using information from the Form N-SAR, which is at semi-annual frequency, I conduct this analysis with fund-semi-annual observations to avoid repeating the same value multiple times. Specifically, using SUR approach, I estimate the following system of equations and allow correlations in the residuals:

$$\begin{aligned}
RIK_{i,t} &= \alpha_1^1 + \alpha_2 \%equity\ funds + \alpha_3^1 Illiquid_i + \delta^1 FundChars + \upsilon_t + \varepsilon_{i,t}^1 \\
\%Cash_{i,t} &= \alpha_1^2 + \alpha_3^2 Illiquid_i + \delta^2 FundChars + \upsilon_t + \varepsilon_{i,t}^2 \\
Borrow\ permission_{i,t} &= \alpha_1^3 + \alpha_3^3 Illiquid_i + \delta^3 FundChars + \upsilon_t + \varepsilon_{i,t}^3 \\
Overdraft\ or\ bankloan_{i,t} &= \alpha_1^4 + \alpha_3^4 Illiquid_i + \delta^4 FundChars + \upsilon_t + \varepsilon_{i,t}^4
\end{aligned} \tag{1}$$

where $RIK_{i,t}$ is an indicator variable that equals to one if the fund *i*'s investment company has filed for the exemption before the semi-annual period ending at time *t*, and zero otherwise; *% cash* is the percentage of cash holdings of a fund; *Borrow permission* captures the ex-ante permission of borrowing, which takes a value of one if a fund is allowed to borrow, and zero otherwise; *Overdraft or bank loan*, captures the ex-post borrowing behavior, which takes a value of one if a fund has overdrafts or bank loans outstanding that exceeds a 1% of net assets at any one time during the reporting period on a Form N-SAR, and zero otherwise; %*equity funds* and the *Illiquid* dummy are defined previously; *FundChars* include investment company size measured as the natural logarithm of total TNA of all underlying funds (*InvstCom size*), the natural logarithm of fund size (*Fund size*), front- and end-load fees (*Load*), that equals to one if a fund has either front- or end-load fees, standard deviations of the past six-month flows (*StdFlow*), turnover ratio (*Turnover*), expense ratio (*Expense*), age in log (*age*), and a dummy variable *Inst* equals to one if

the fund is institutional-oriented. Among these variables, except that the correlations between the size variables are over 50%, all other pairwise correlations are moderate. I further include year dummies in the estimation and standard errors are clustered at the fund level.

Results are reported in Table 2. Columns (1) to (4) are without fund characteristics, and columns (5) to (8) are with fund characteristics. For regression systems both with and without control variables, we reject the null hypothesis that the regressions' residuals are uncorrelated. The Breusch-Pagan test statistic (chi-square) is 738 for without controls and 713 for with controls, both with a p-value less than 0.001. This finding provides supporting evidence that the choices of liquidity management tools are not independent from each other. Instead, they are determined jointly. The pair correlations in the residuals are reported at the end of this table, which reflect the correlations in the choices of different liquidity management tools after accounting for the part explained by observed characteristics used in this equation system (1). The positive correlations in the residuals between the RIK regression and the use of cash and external borrowing from bank suggests that there are complementary relations between these different liquidity management tools. Alternatively, for funds who are more likely to use cash and/or external borrowings, they are also more likely to use RIK to manage liquidity. We also observe a strong negative relation between the use of cash and borrowing from bank, which is consistent with the view that cash is considered as negative debt.

The negative estimated coefficients on *% equity funds* show that fund companies with a lower percentage of equity funds are associated with a greater propensity of filing for the exemption. Alternatively, fund companies are more likely to obtain the flexibility in applying RIK when there are more illiquid funds managed by the company. A one standard deviation (0.186) increase in the *% equity funds* is associated with 179 (−0.096 x 0.186) to 204 (−0.110 x 0.186) basis points

decrease in the probability of funds' filling for the RIK exemption. This implies a 2.5% to 2.85% decrease in the unconditional probability of filling for the exemption (71.7%). Furthermore, the positive estimated coefficients on *Illiquid* in columns (1) and (5) show that illiquid funds are more likely to have RIK as an option to manage liquidity shocks. Being an illiquid funds increases the probability of filling for RIK exemption by 640 to 750 basis points, which implies an 8.9% to 10.5% increase in the unconditional probability of filing for RIK exemption at the mean (71.7%). Both observations are consistent with the view that asset liquidity is a driving factor for the potential use of RIK.

If we look at the estimated coefficients across different liquidity management variables, we observe that there are some common fund characteristics that determine the use of different liquidity management tools. Funds with more volatile flows are more likely to apply for RIK exemption as well as borrowing externally. Younger funds are more likely to apply for RIK exemption and hold more cash. This is consistent with the view in Chevalier and Ellison (1999) that less reputable funds experience a stronger flow to poor performance sensitivity. Furthermore, funds charging higher expense ratios are more likely to apply for RIK exemption, hold more cash, and borrow externally. Pastor, Stambaugh, and Taylor (2018) argues that, in the equilibrium, funds charging higher expense ratios are less liquid and conduct more exotic strategies. On the other hand, we also observe some differences in the set of variables that determines the use of a particular liquidity management tool. For example, institutional-oriented funds are more likely to borrow externally. Funds charging load fees are more likely to apply for RIK exemption, while hold less cash. These observations suggest that there are some common features of the fund, such as asset illiquidity, exotic fund strategy, and/or less predictable capital flows, that drive the use of all types of liquidity management tools. At the same time, each individual liquidity management tool has

its unique feature so that different type of funds chooses to have/utilize a different combination of liquidity management tools.

For robustness, I also model the choices of RIK in a reduced form with logit estimation, where the depend variable is *RIK*, an indicator variable that equals to one if the fund i's investment company has filed for the exemption. Instead of modelling the alternative liquidity management tools simultaneously, I include them in the list of explanatory variables. Appendix Table A.3 presents the results with odds ratio reported. We continue to observe that percent of equity funds is negatively related to the propensity of using RIK and illiquid funds is positively related to the propensity of using RIK. Coming to the alternative liquidity management measures, I find that percentage of cash holdings and the actual use of overdraft or bank loan are statistically positively correlated with the propensity of filing for the exemption. These results complement with the findings using the SUR approach.

4. Consequences of RIK

4.1 Effect of RIK on investors' capital allocation behavior

In this section, I explore how filing for the exemption affects investors' capital allocation behavior. On one hand, the increased likelihood of RIK lowers investors' incentive to run on the fund by reducing the negative externalities associated with fire sales on non-redeeming investors. On the other hand, investors investing in mutual funds generally are not willing to take stock shares over cash, especially when the basket of shares received is at the manager's discretion.

How do both sides of effects affect investors' purchase and redemption behavior? I take a revealed preference approach by comparing the flow-performance sensitivity for the funds who have filed for the exemption with that for funds have not. Specifically, I estimate the following Difference-in-Differences (DiD) regression:

$$Flow_{i,t+1,t+3} = \beta_1 + \beta_2 Perf_{i,t-2,t} + \beta_3 Perf_{i,t-2,t} \times RIK_{i,t-2} + \delta Controls + \alpha_i + \mu_{s,t} + \varepsilon_{i,t+1} \qquad (2)$$

where $Flow_{i,t+1,t+3}$ is the three-month net flow in fund *i* from month *t+1* to *t+3*, $Perf_{i,t-2,t}$ is the three-month performance, measured in either *CAPM* alpha, Fama-French 3-factor (*FF3*) alpha, or Carhart 4-factor (*Carhart4*) alpha, of fund *i* from month *t-2* to *t*;[11] $RIK_{i,t-2}$ is whether the fund *i* has filed for exemption before month *t-2*, and $Perf_{i,t-1,t} \times RIK_{i,t-2}$ is the interaction term between the performance measure and the *RIK* dummy. Controls include fund's filing status as a standalone variable (*RIK*), and all the control variables used in the determinants model in equation (1). Besides, to allow for the possibility that alternative liquidity management tools affect the flow-performance sensitivity, I include all the three variables, *% cash*, *Borrow permission*, and *Overdraft or bank loan*, as well as the interaction terms between these variables and the performance measure in the regression. Furthermore, prior research (James and Karceski, 2006; Chen, Goldstein, and Jiang, 2010; Evans and Fahlenbrach, 2012) document that investor clienteles and asset liquidity have impacts on the flow-performance sensitivity. I allow for these effects by including the interaction terms between performance and the *Inst* dummy variable and the *Illiquid* dummy variable. I also control for fund fixed effects, α_i, to account for any time-invariant fund characteristics. In order to control for the commonality in the flow into and out of a certain style at a given point of time shown in Nanda and Wei (2018), I include style×year fixed effects, $\mu_{s,t}$, in the regression. Standard errors are adjusted for within-cluster correlations at the fund level.

Results are reported in Table 3. Columns (1) to (3) use the full sample. Columns (4) to (6) use the sample of observations with negative performance to learn investors' redemption decision and

[11] These alphas are calculated using net-of-fee returns. My results are qualitatively similar when using alphas estimated with gross returns. Following Fama and French (2010) and Pastor, Stambaugh, and Taylor (2015), monthly gross returns are monthly net returns plus 1/12th of annual expense ratio.

columns (7) to (9) use the sample of observations with positive performance to learn investors' purchase decision. The significantly positive coefficients on the performance measures show that fund flows are highly responsive to past performance, a relation well documented in prior literature. Also consistent with Berk and van Binsbergen (2016) and Barber, Huang, and Odean (2016), investors seem to respond more strongly to *CAPM* alpha comparing to other multi-factor alphas.

The focus of my analysis is the coefficient for the interaction term between performance measures and RIK. In the full sample, results show that all coefficient estimates are negative, and statistically significant for the specification with *CAPM* alpha and *FF3* alpha. Using the CAPM alpha as an example, the economic magnitude of decreased flow-performance sensitivity is about 16.7% (0.054/0.324). To infer investors' redemption and purchase decisions separately, I create subsamples of observations with negative performance and positive performance respectively. I find that the reduction in flow-performance sensitivity mainly comes from the positive performance regime. This finding suggests that investors are less sensitive to good performance in funds with the RIK exemption. Alternatively, when investors make decisions on which funds to invest in, investors seem to reward funds' good performance less when the fund has RIK exemption.

Given that fund managers tend to maximize the fund size, this reduced sensitivity in flow to good performance indicates a cost to the fund with RIK exemption. Then where does the benefit come from? Next, I look into subsamples where I expect the benefits of having RIK to be greater. Chen, Goldstein, and Jiang (2010) show that investors are more sensitive to poor performance in illiquid funds because redemptions from funds investing in comparatively more illiquid assets have stronger negative externalities on other investors comparing to funds investing in more liquid assets. The positive and significant coefficient on the interaction term between *Perf* and *Illiquid* in

Table 3 is consistent with this view. Since the potential benefit of mitigating fund run is greater in the illiquid fund sample compared to in the liquid fund sample, I investigate the effect of RIK in subsamples of illiquid funds and liquid funds.

Results are reported in Table 4, with Panels A and B for the subsample of observations with negative performance and positive performance, respectively. In each panel, Columns (1) to (3) are for illiquid funds and Columns (4) to (6) are for liquid funds. All control variables used in Table 3 are included in the estimation, but not reported in the table for brevity. In Panel A, we observe that the reduced sensitivity of flow to poor performance exists in the subsample of illiquid funds. Using *CAPM* alpha as an example, the estimated coefficient for performance is 0.388 and that for the interaction term between the performance and RIK is −0.093. This reduction in flow-performance sensitivity is 24.0% (0.093/0.388), which is economically meaningful. For the subsample of liquid funds, the estimated coefficients on the interaction term are positive, although only significant at 10% level for the specification using *Carhart4* alpha.

In Panel B, we observe that all estimated coefficients for the interaction term between the performance and RIK are negative, which confirms the findings in Table 3 that the increased likelihood of RIK reduces investors' sensitivity to good performance. Using *CAPM* alpha as an illustration for the subsample of liquid funds, the estimated coefficient for performance is 0.457 and that for the interaction term is −0.146. This implies a reduction of 31.9% (0.146/0.457) in flow to good performance sensitivity for liquid funds. Although it is more statistically significant in the subsample of liquid funds, the estimated coefficients on the interaction term between Perf and RIK don't differ to an economically significance between the subsample of illiquid and liquid funds.

Given that the RIK funds and non-RIK funds might be systematically different as shown in the previous section, I adopt a matched sample approach to provide additional evidence on the implications of the RIK on funds' flow-performance sensitivity. I rely on recent advances in matching technique and use an entropy balanced sample of treatment and control funds. Entropy balancing is a reweighting technique that represents a generalization of the traditional propensity score matching to achieve significantly improved matching between the treatment and control samples (Hainmueller, 2012; Agarwal, Vashishtha, and Venkatachalam, 2018). Unlike the propensity score matching where a control fund is assigned a weight equal to either one or zero, the entropy balancing approach 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 the control funds because most control funds are assigned nonzero weights instead of being dropped from the analysis. I report the results in Appendix Table A.4. In the Panel A, we observe that the matched characteristics of the two groups of funds are almost the same statistically, suggesting a good match. Panel B and Panel C report results for flow-performance sensitivities in the overall sample and in the subsamples of liquid and illiquid funds. We continue to find that funds' flow-performance sensitivity is reduced when the fund performs poorly in the sample of illiquid funds. Furthermore, funds' flow-performance sensitivity is reduced when the fund performs well.

Taken together, the results in the flow-performance analysis part suggest that the effects of increased likelihood of RIK are twofold. First, having RIK reduces investor's sensitivity to poor performance for illiquid funds. This finding suggests that investors perceive RIK as an effective way for illiquid funds to manage liquidity when the fund performs poorly. Second, having RIK

also reduces investor's sensitivity to good performance. This finding suggests that when investors make decisions on which funds to invest in, they show some concerns with funds having RIK.

4.2 Effect of RIK on price pressure of underlying assets

In the last section, I investigate investor's capital allocation behavior for funds with and without exemptions for RIK. One assumption is that, by delivering underlying assets to redeeming investors rather than selling those assets in the market, RIK helps mitigate asset fire sales. One observable outcome of asset fire sale in mutual funds, documented in Coval and Stafford (2007), is the downward price pressure on the underlying stocks held by the funds faced with large outflow. Thus, in this section, I examine the effect of RIK on the price pressure of underlying assets held by funds under a potential fire sale condition.

To construct the price pressure measure induced by mutual fund fire sales, Coval and Stafford (2007) uses actual sales conditional on large investor outflows. However, there is a concern that, even facing liquidity shocks, managers could still strategically sell off assets based on the information they have. Thus, the asset fire sale that we try to capture from liquidity shocks could be contaminated by the information in the actual selling behavior (Edmans, Goldstein, and Jiang, 2012; Huang, Ringgenberg, and Zhang, 2016; Agarwal and Zhao, 2017, 2018). Edmans, Goldstein, and Jiang (2012) proposes a method to alleviate this concern by constructing hypothetical sales proportionate to the previously disclosed portfolios. Therefore, the flow pressure constructed does not reflect funds' discretionary trades possibly related to information with the underlying asset. Specifically, following their methodology and using data from Thomson Reuters S12 database, I construct the flow-induced pressure at the stock-quarter level in the following way:

$$MFFlow_{k,t} = \sum_{j=1}^{n} \frac{F_{j,t} \times Shares_{k,j,t-1} \times PRC_{k,t-1}}{TA_{j,t-1} \times Vol_{k,t}} \qquad (3)$$

where $MFFlow_{k,t}$ is the pressure measure induced by mutual fund flows on stock *k* in quarter *t*, $F_{i,t}$ is the absolute value of dollar outflow for fund *i* in quarter *t*, $\frac{Shares_{k,j,t-1} \times PRC_{k,t-1}}{TA_{j,t-1}}$ is the fund's ownership of the stock as a percentage of fund total asset at the beginning of the quarter, and $Vol_{k,t}$ is the dollar trading volume of the stock during the quarter. The summation is only over funds *j* for which outflow is equal to or larger than 5%. Since this analysis uses funds' holdings and involves stocks trading information, the sample narrows down to US stocks.

To separate the pressure induced by funds with RIK and without, following Agarwal and Zhao (2018), I further decompose *MFFlow* into the following two components:

$$MFFlow\_RIK_{k,t} = \sum_{j=1}^{n} \frac{F_{j,t} \times Shares_{k,j,t-1} \times PRC_{k,t-1}}{TA_{j,t-1} \times Vol_{k,t}} \times (RIK_{j,t})$$

$$MFFlow\_noRIK_{k,t} = \sum_{j=1}^{n} \frac{F_{j,t} \times Shares_{k,j,t-1} \times PRC_{k,t-1}}{TA_{j,t-1} \times Vol_{k,t}} \times (1 - RIK_{j,t}) \quad (4)$$

where $RIK_{j,t}$ is an indicator variable equals to one if fund *j* has applied for the exemption for RIK under the rule 18f-1 before quarter *t*, and zero otherwise. Thus, the sum of these two mutual fund pressure measures for funds with and without RIK equals to the total fund pressure measure *MFFlow*.

To measure the price pressure induced by mutual fund flows over the same quarter, I estimate the following regressions:

$$CAR_{k,t} = \gamma_1 + \gamma_2 MFFlow\_RIK_{k,t} + \gamma_3 MFFlow\_noRIK_{k,t} + \upsilon_t + \eta_{k,t} \quad (5)$$

where $Car_{k,t}$ is the quarterly cumulative abnormal return (CAR) of stock *k* in quarter *t*. I use three different approaches to estimate the CAR. First, as in Edmans, Goldstein, and Jiang (2012), CAR is calculated over the benchmark of the CRSP equal-weighted index. Second, following Agarwal and Zhao (2018), I use daily stock returns data within the quarter and obtain *CAPM* alpha, *FF3* alpha, and *Carhart4* alpha to compute for the CAR. I further control for quarterly fixed effect, υ_t, in the regression. Standard errors are clustered at the stock level.

Table 5 presents the results. We observe that the estimated coefficients on the two decomposed fund pressure measures are both significantly negative, suggesting a negative price pressure on the underlying stocks from both types of funds. However, all the estimated coefficients of *MFFlow_RIK* are smaller than those of *MFFlow_noRIK*, suggesting price pressure per unit from funds with RIK is smaller comparing to that from funds without RIK. Formal tests to compare each pair of these coefficients are conducted and *p-values* are reported in the last row of the table. All the differences between the two coefficients of *MFFlow_RIK* and *MFFlow_noRIK* are statistically different, which confirms that the price pressure induced by funds with RIK is smaller than that induced by funds without. These findings support the argument that RIK helps reduce the selling pressure on stocks caused by extreme investor redemptions.

4.3 Performance-outflow analysis

Investors' incentive to run on a fund comes from the fact that outflow negatively affects fund returns. In this section, I test whether RIK helps mitigating the need to run by reducing the negative relation between performance and outflow. Specifically, I compare the impact of outflows on fund returns in funds with RIK to funds without by estimating the following regression:

$$Perf_{i,t,t+2} = \phi_1 + \phi_2 Outflow_{i,t,t+2} + \phi_3 Outflow_{i,t,t+2} \times RIK_{i,t} + \delta Controls + \alpha_i + \mu_{s,t} + \varsigma_{i,t} \qquad (6)$$

where $Perf_{i,t,t+2}$ is fund *i*'s performance in the three months from month *t* to *t+2*, measured by *CAPM* alpha, *FF3* alpha, and *Carhart4* alpha, $Outflow_{i,t,t+2}$ is an indicator variable for whether the net flow is lower than −5% of total NAV.[12] Controls include a set of variables that are related to fund performance, lagged performance measures, natural logarithm of fund size, expense ratio, turnover ratio, natural logarithm of age in months, and a dummy variable for intuitional-oriented funds. Fund fixed effects and style×year fixed effects are included in the regression and standard errors are adjusted for within-cluster correlations at the fund level.

Table 6 presents the results. First, we observe that large outflows are indeed associated with lower contemporaneous performance using all three different measures. This indicates that large outflows are disturbing to funds' operations and detrimental to funds' performance. What I focus on is the interaction term between the *Outflow* and the *RIK* variable. The positive estimated coefficients show that, conditional on the same level of outflow, performance of funds with higher likelihoods of RIK is better than that of other funds. This positive effect is statistically significant for the specification using *CAPM* alpha. Economically, given a large outflow, funds with the flexibility of utilizing RIK are better off, in terms of performance, by 19.2% (0.0015/0.0078) measured by *CAPM* alpha. Since the estimated coefficients on this interaction term are not statistically significant for the specifications using *FF3* alpha or *Carhart4* alpha, these results provide weak support for the argument that RIK helps improve fund performance when facing large outflows. This finding complements the findings in the price pressure analysis from the previous section. Conditional on a large outflow, funds who are more likely to use RIK can mitigate asset fire sales by directly delivering portfolio stocks to redeeming investors, which could

[12] The results are similar when outflow is constructed in a relative way. Specifically, outflow is one when the fund flow is less than the 25th percentile of flows in a sample of funds from the same style and in the same quarter.

result in a better performance and reduce the negative externalities on the other investors who stay in the fund.

5. Analysis of RIK utilization

Results so far are ex-ante analysis examining the effects of a higher likelihood of implementing RIK on funds' flow-performance sensitivity, performance-outflow relation, and asset fire sale effect. This section, in turn, investigates actual utilization of RIK events to provide further insights on how often, when, and how RIK is utilized by funds.[13] I first provide information on the frequency and magnitude of RIK events. Then I investigate what types of securities are used to deliver in RIK.

5.1 Data collection and descriptive statistics

The SEC does not provide a guideline on the disclosure of actual utilization of RIK. I search through SEC filings and find that funds disclose the actual use of RIK in the footnote of their annual/semi-annual financial statements on Form N-CSR and Form N-CSRS. To systematically identify RIK events, I use a two-step process. First, a Python program is used to search through these two types of forms for all funds in my sample and to look for keyword strings "in kind", "in-kind", or "redemptions in securities". Second, if a filing contains any of these keywords, I manually go through the filling and collect information on the RIK activities. For RIK, different fund companies report different information. Most commonly reported information includes RIK total amount for the past six-month or the past year, and the realized gain or loss associated with these RIK transactions. Very occasionally, funds disclose the transaction party and date. I exclude those cases where the transaction is between affiliated parties or within family, or for

[13] Chernenko and Sunderam (2016) provides some analysis on the ex-post use of redemptions in kind. They select 50 fund-quarter observations with large outflows and search in the SEC filings for information related to the use of redemptions in kind. They find that 3 fund-quarter has in-kind redemptions, where the combined net outflows accumulate to $123.3 billion and $7.7 billion (6%) of the net outflows were redeemed in-kind.

reorganization or liquidation purposes if such information is disclosed by the fund. I conduct this analysis for filings with filing dates between year 2004 and 2012. This sample covers three years before the financial crisis (2004-2006), three years during the financial crisis (2007-2009), and three years after (2010-2012). A few examples of RIK disclosures are provided in Appendix C.

The final sample includes 713 RIK disclosures for 385 funds in the sample. This implies that almost 12.8% of funds in the sample has used RIK during this period (2004-2012). Among these 713 events, 94 (13.1%) are from companies without the exemption under Rule 18f-1. This proportion is smaller than the percentage of fund-quarter observations with no exemptions, 28.7% (1-71.3%), which supports the earlier argument that filing for the exemption increases the likelihood of using RIK.

Table 7, Panel A, provides information on the number of disclosures, average RIK amount, and total RIK amount by year. Figure 1 provides a visual view on the number of RIK disclosures and total RIK amount by year. We observe that year 2006 and year 2008 have the top two RIK disclosures in terms of number, 110 and 118 respectively. For the other years, the number of RIK disclosures ranges from 58 to 80. In terms of the total amount of RIK, we observe an increase from $4,196 million in year 2004 to $14,630 million in 2006 and remains relatively high until 2008. After 2008, the total amount decreases to $4,153 million in 2010 and then increase back to $13,520 in 2012. The largest number of RIK disclosures in 2008 seems to suggest that RIKs are more likely to be use during time periods when the market is illiquid and with a poor prospect.

In Table 7, Panel B, we observe the frequency of disclosures by funds. For most of funds (265), they only have one RIK disclosure during year 2004 to 2012. However, we have 130 funds that have multiple RIK disclosures during the period, with 39 of them have four and more disclosures. The top eight users in the sample are Sequoia Fund, T. Rowe Price Mid-Cap Growth Fund, Eaton

Vance Tax-management Growth Fund, WilliamsBurg Government Street Equity Fund, WilliamsBurg Government Street Mid-Cap Fund, Schroder North American Equity Fund, and T.Rowe Price Equity Income Fund, and T. Rowe Price Blue Chip Growth Fund. Given that we observe three T. Rowe funds and two WilliamsBurg funds are on the top list, it suggests a fund family level fixed effect. That is, for certain fund families, RIK is more likely to be utilized across different funds managed under the same fund family.

Furthermore, Panel C of Table 7 provides summary statistics on the overall sample average transaction amount and the realized capital gain/loss associated with RIK transactions. The mean and median transaction amount are $119 million and $61 million. In terms of percentage of fund's TNA, they correspond to 16% and 6%. These numbers are economically large, which can bring non-trivial liquidity consequences for a fund if the fund didn't deal with the redemptions with RIK. For capital gains/losses, we observe that most of the transactions involve stocks with accumulated tax gains rather than losses, 626 versus 63 cases. This provides supportive evidence that RIK might be used for tax management given that RIK allows funds to defer tax gain realizations.

5.2 Does funds' trading behavior change when utilize RIK?

With RIK, funds directly deliver securities to redeeming shareholders rather than selling securities on the market for cash. One interesting question to ask is whether a fund behaves differently when redeem in kind versus redeem in cash? In the other words, would the fund deliver the same basket of securities to the redeeming shareholders as if it were selling these securities on the market for cash?

A few reasons suggest that this might not be the case. The first one is related to liquidity costs. By selling securities on the market, a fund faces trading spread and negative price pressure which could adversely affect a fund's performance. Thus, funds often take liquidity of the underlying

stocks into consideration when funds make decisions on which stocks to sell. There are evidence showing that funds tend to sell liquid holdings to meet redemption requests (Lou, 2012; Jiang, Li, and Wang, 2017). By avoiding liquidating stocks on the market through RIK, liquidity of the stocks might not be a concern to the fund. This suggests liquidity of stocks might not be significantly related to the trading decision. Even more, funds can deliver less liquid stocks to maintain a comparatively more liquid portfolio to prepare for future redemptions.

The second one is related to fund managers' private information on portfolio stocks. If we assume that fund managers have the ability predicting the future loser stocks, instead of selling them on the market which would reveal his/her private information and depress the stock price, the fund manager can deliver those stocks to the redeeming investors.

Finally, the decision could also be influenced by the bargaining power between the fund and the redeeming shareholder. If the redeeming shareholder is a large institutional investor, for the sake of future business, the fund might deliver securities that are liquid, and/or are likely to perform well in the future.[14]

To conduct the analysis, I use funds' quarterly holdings data and infer their trading behavior by examining the change in holdings in two consecutive quarters. Since RIK disclosure is at the semi-annual or annual level, to obtain a more precise estimation, I try to pin down the specific month when the RIK was utilized by matching RIK magnitude to funds' monthly flows. For most cases, there is one month during the semi-annual period that has a large outflow, which I can reasonably assume the RIK happened in that month.

[14] One interesting question would be examining whether a fund treats different shareholders differently when implementing RIK. However, in the fund disclosure, it is not required to disclose who the redeeming shareholder is. What I document is an average effect of all RIK events.

To test whether funds' trading behavior changes, I compare funds' trading pattern in response to outflows during quarters where there were purely cash redemptions to those where there were RIK. Lou (2012) provides a framework to test that managers follow a proportional selling strategy when they receive net capital outflows. This methodology is later implemented in Berger (2017). Motivated by these studies, I model funds' trading behavior in response to capital flows using the following panel regression:[15]

$$Trade_{i,j,t} = \delta_0 + \delta_1 Flow_{i,t} + \delta_2 Am\_illiqd_{i,j,t-1} + \delta_3 Flow_{i,t} \times Am\_illiqd_{i,j,t-1} +$$

$$\delta_4 AbSI_{i,j,t-1} + \delta_5 Flow_{i,t} \times AbSI_{i,j,t-1} + \tau_{i,j,t} \qquad for\ Flow_{i,t} < 0. \qquad (7)$$

The dependent variable, $Trade_{i,j,t} = \frac{shares_{i,j,t}}{shares_{i,j,t-1}} - 1$, is the percentage trading in stock *j* by fund *i* in quarter *t*, with split adjustments. $Flow_{i,t}$ is the quarterly percentage flow for fund *i* in quarter *t*. To focus on funds trading behavior when there are redemptions, I conduct the analysis in the sample of fund-quarters with net outflows. That is, when flow is negative. $Am\_illiqd_{i,j,t-1}$ is the Amihud liquidity measure developed in Amihud (2002). To avoid the influences of trading happened within the quarter *t* on stocks' liquidity, I use the data ends before the beginning of the quarter *t* for computation. To capture the negative information about a stock, I follow Huang, Ringgengerg, and Zhang (2016) and use abnormal short interest ratio, $AbSI$, which is a well-established predictor of negative future returns. The abnormal short interest ratio is the difference between actual and expected short interest as in Karpoff and Lou (2010). To calculate the expected short interest, at the beginning of each month, each stock is assigned to one of 27 portfolios constructed by independently sorting stocks into terciles based on market capitalization, book-to-

[15] Results are similar when I examine the trading pattern for fund-quarters with net outflows larger than 1% or 5% of funds' net asset at the beginning of the quarter.

market, and the prior one-year return, all measured at the end of the previous month. Then I run the panel regressions of the form:

$$SR_{i,t} = Sizelow_{i,t} + Sizemed_{i,t} + BMlow_{i,t} + BMmed_{i,t} + PastRetlow_{i,t} + PastRetmed_{i,t} + \gamma_k + \tau_{i,t} \quad (8)$$

where the dependent variable, $SR_{i,t}$, is the short interest ratio of the firm *i* in month *t*, as the ratio of shares held short to the number of shares outstanding, $Sizelow_{i,t}$, $Sizemed_{i,t}$, $BMlow_{i,t}$, $BMmed_{i,t}$, $PastRetlow_{i,t}$, and $PastRetmed_{i,t}$ are indicator variables that equal one if firm *i* is assigned to the corresponding portfolio, and γ_k represents *k* industry dummies defined using two-digit SIC codes. Using abnormal short interest rather than raw short interest ratio allows me to identify stocks which likely had recent unexpected negative signals rather than stocks which always have high short interest.

To compare the trading patterns for quarters with purely redemptions in cash and quarters with RIK, I separately estimate the equation (7) for the fund-quarter sample with RIK transactions and the sample without. For the cases where I can pin down the specific month when RIK happens, I code the corresponding quarter as with RIK transactions. For the other cases, where it is difficult to pin down the specific quarter it happened, I consider both quarters within that semi-annual reporting period as with RIK transactions. Given that the overall sample spans for nine years from 2004 to 2012, during which market aggregated liquidity change quite a bit, funds might behave differently overtime. I breakdown the overall sample into three subsamples, 2004 to 2006, 2007 to 2009, and 2010 to 2012, to conduct the analysis. Standard errors are clustered at the fund level to allow for correlations in the trading behavior of the same fund.

Table 8 presents the results, with Panel A for years 2004 to 2006, Panel B for years 2007 to 2009, and Panel C for years 2010 to 2012. Columns (1) to (2) are for the fund-quarters without

RIK transactions and columns (3) to (4) are for fund-quarters with RIK transactions. To consider the possibility that various liquidity management tools could affect funds' trading behavior, I control for percentage cash holdings, front- and end- loads, and their interactions with the flow variable in columns (2) and (4).

Consistent with the findings in the literature, fund trading is highly responsive to fund flows. In all three panels, the estimated coefficients on the outflow variable is around 1, suggesting that funds trade one-for-one dollar when facing outflows. Furthermore, in the non-RIK sample, the estimated coefficient on the interaction term between outflow and Amihud illiquidity measure are negative, although not statistically significant. This is consistent with the finding in the literature that funds tend to sell more liquid assets when facing redemption requests. In the RIK sample during year 2004 to 2006, we also observe negative estimated coefficients on the interaction term between outflow and Amihud illiquidity measure. This finding suggests that during this period, funds doing RIK behave similarly as funds redeem in cash in terms of their portfolio churning behavior. In contrast, in Panels B and C, we observe that, in the RIK sample, the estimated coefficients are consistently positive and statistically significant. This evidence indicates that, during years from 2007 to 2012, when fund managers utilize RIK, they tend to deliver more illiquid stocks. Using the estimated coefficient for 2007-2009 (8.050) to illustrate the economic magnitude, one standard deviation increase in the Amihud illiquidity measure leads to 0.217 increase in the trade-flow sensitivity. That is around a quarter of the trade flow sensitivity for very liquid stocks (0.833).

These different findings in different time periods are interesting. I only find funds delivering more illiquid stocks during periods when the market is more illiquid and more volatile. This suggests that fund managers, when making decisions on what types of stocks to deliver to

redeeming shareholders, make a tradeoff between the welfare of the remaining investors and that of the redeeming ones. During periods when the market is comparatively liquid and future prospects look good, funds deliver stocks whose liquidity is similar to the portfolio's liquidity or better so that the redeeming investors could easily turn these securities into cash. At the same time, such behavior shall not affect the remaining investors much as the market liquidity is good for funds to rebalance its portfolio in the future. In contrast, during periods when the market is more illiquid and the future is less certain, funds using RIK to deal with large outflows tend to deliver more illiquid securities as a way to cash out on these illiquid assets without moving the market prices and also to maintain a more liquid portfolio to prepare for future redemptions. Such behavior might potentially affect redeeming investors as when they go to sell the securities on the market, they might incur large transaction costs including market impact costs. However, funds' current and future prospects during such a difficult time might be a bigger concern for fund managers.

Next, going to the hypothesis that funds might deliver stocks with potential poor future performance, I do not find any evidence suggesting that fund managers choose stocks based on their private information of stocks' performance in the future. All the estimated coefficients on the interaction term between the flow variable and the abnormal short interest variable are statistically insignificant throughout Panels A to C.

One can argue that the relative illiquidity and underperformance of a stock in the overall portfolio, rather than the absolute levels, matter in managers' decisions. To entertain this possibility, I further conduct the analysis using adjusted illiquidity and abnormal return measures. Specifically, for the illiquidity measure, I subtract the median illiquidity of the stocks held by the fund each quarter. Similarly, I adjust for the abnormal short interest measure. Results are reported

in Appendix Table A.5. The estimated coefficients are fairly similar to the ones without adjustments, thus leading us to draw quantitatively the same conclusions.

5.3 Flow-performance analysis using RIK utilization data

With the information on which funds have actually used RIK, I repeat the flow-performance analysis in Section 4.1. Specifically, I compare funds that have used RIK with funds without RIK exemption and redo the analysis for illiquid funds and liquid funds. Results are reported in Appendix Table A.6. We observe that, for illiquid funds, the sensitivity of flow to poor performance is significantly lower for RIK users. This finding conforms the previous finding that RIK helps mitigate fund run behavior when funds perform poorly. Furthermore, there is evidence that RIK users face lower flow-performance sensitivity when funds perform well, consistent with the findings in Section 4.1.

Taken together, these ex-post analyses first show that the RIK transactions happen throughout all years in the sample and magnitude of RIK transactions are significant to a fund. Second, evidence suggest that fund managers strategically pick stocks that are illiquid to deliver during time periods when the market is illiquid and volatile. Third, illiquid funds that actually use RIK benefit by facing a lower flow-performance sensitivity when funds perform poorly.

6. Conclusions and discussions

This paper provides empirical evidence on the motivations and consequences of RIK in open-end equity mutual funds. On one hand, RIK allows funds to avoid asset fire sales when facing large redemptions, thus reduces investors' incentives to run on the fund. On the other hand, mutual fund investors seeking liquidity often are not willing to take shares instead of cash from the fund. This problem is exacerbated when fund managers have the discretion over which securities to deliver in RIK.

By modelling the choices of various liquidity management tools simultaneously, I find that asset illiquidity is positively correlated with the likelihood of using RIK and that RIK complements cash holdings and borrowing in managing funds' liquidity risk. I further document a few consequences of increased likelihood of utilizing RIK. First, investors are less sensitive to poor performance in the subsample of illiquid funds that are more likely to use RIK, suggesting that RIK helps mitigate investors' run-like behavior. However, investors' flows are also less sensitive to good performance of funds with increased likelihood of using RIK, providing evidence on the existence of costs associated with RIK. Second, conditional on a large outflow, RIK helps reduce the flow-induced price pressure on stocks held by funds with a higher likelihood of using RIK. Third, there is some evidence that RIK improves fund performance conditional on a large outflow. Finally, funds utilize RIK in significantly large transactions across all years in the sample period that include different market conditions. Evidence indicates that fund managers pick stocks that are more illiquid to deliver in RIK during periods when the market is illiquid and volatile. These findings together help understand the pros and cons for funds adopting the use of RIK, one of the liquidity management tools utilized by open-end mutual funds and discussed in the recent policy changes.

As we know, mutual funds have multiple tools to manage liquidity. Each of them has their advantages and limitations. RIK is unique in the following two aspects: 1) theoretically, the maximum amount of redemption shocks RIK can deal with is 100% of fund assets, and 2) RIK allows funds to transfer liquidation costs to the redeeming shareholders. The difficulty in implementing RIK is the reluctance of investors in receiving stock shares instead of cash, which could impose reputational costs on the fund. The other tools also come with benefits and costs. First, cash can be used to absorb net outflows. Since holding cash forces funds to forgo profitable

investment opportunities, on average, funds only hold around 3% of assets in cash in my sample. This amount limits funds' ability in using cash to handle large liquidity shocks. Second, funds can borrow externally from banks and internally within a fund family. Borrowing comes with explicit borrowing costs. On top of that, maintaining the ability to borrow comes with costs. For instance, to maintain the line of credit at the bank, fund families need to pay commission fees. To borrow internally from the money market funds within the fund families, these money market funds are exposed to liquidity risks from the borrowing funds and therefore become riskier. Third, funds can potentially cross-trade between funds in the same family to help mitigate the price impact associated with flow-induced trading. Goncalves-Pinto and Schmidt (2013) show that this type of transaction is more prevalent between funds with the same fund manager. The fact that we observe funds simultaneously use all kinds of liquidity management tools speak to the tradeoffs discussed here. Funds might optimally choose among the tools when dealing with liquidity shocks depending on the nature of the shocks and market conditions. Such an investigation is left for future research.

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Figure 1. Number of RIK disclosures and total RIK amount by year

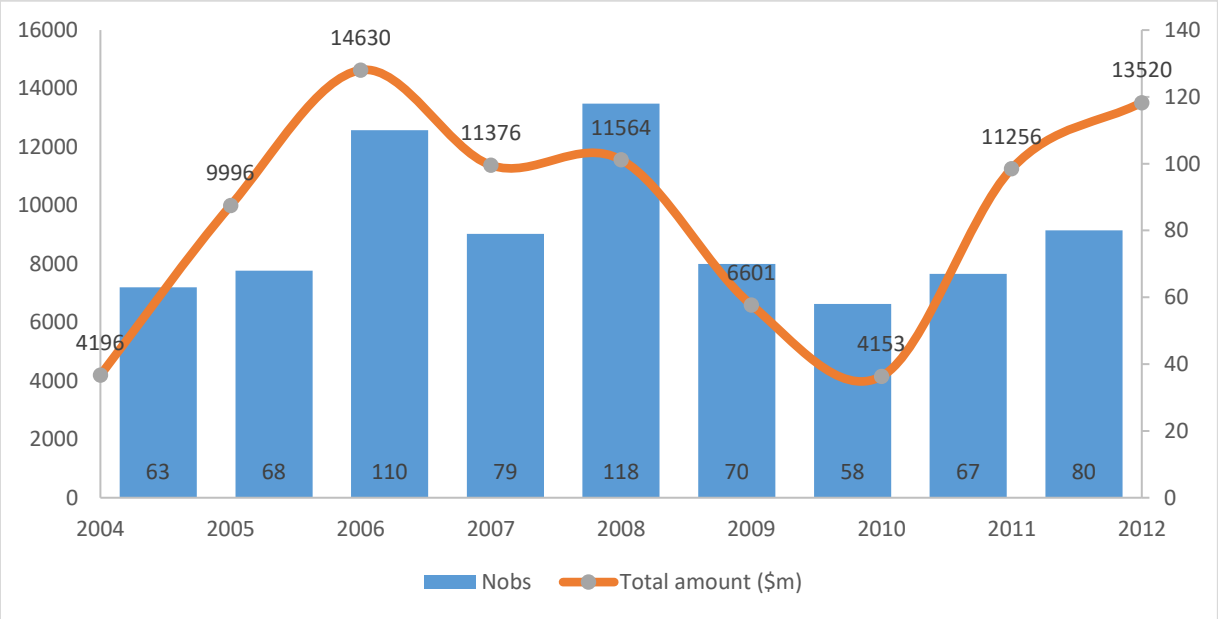

Table 1. Summary Statistics

Panel A. Redemptions in kind status at fund level
The sample contains 2,966 actively managed equity funds from 2006 to 2015.

	# of funds	% of sample
Full sample	2966	
Funds with no exemption	759	25.6%
Funds always with the exemption	2087	70.4%
Funds filed the exemption between year 2006 and 2015	120	4.0%

Panel B. Summary statistics at fund-month level
The sample contains 244,218 fund-month observations from 2966 funds over 2006 to 2015. *RIK* is 1 if a fund has filed for the exemption under section 18(f)(1). *Flow* is quarterly net flow as a percentage of fund's TNA at the end of last quarter. *Fund size* is total asset value of a fund in million. *CAPM alpha*, *FF3 alpha*, and *Carhart4 alpha* are quarterly alpha estimated from the CAPM model, the Fama-French three-factor model, and the four-factor model, respectively. *Illiquid* is 1 if a fund primarily invests in illiquid assets – funds specializing in small-cap, mid-cap, and single-country international stocks (except in UK, Canada, and Japan). *Inst* is 1 if at least 75% of a fund's asset is issued to institutions. *Expense* is the expense ratio of a fund as a percentage of total assets reported in the CRSPMF database. *Turnover* is the turnover ratio of a fund reported in the CRSPMF database. *% cash* is percentage of fund assets held in cash reported in the CRSPMF database. *Load* is 1 if any of a fund share classes charges a front- or back-end load. *Age* is number of months since the fund's inception. *StdFlow* is standard deviation of a fund's monthly flow. *InvstCom size* is total asset value of all funds managed by an investment company in million. *% equity funds* is number of equity funds over total number of funds within an investment company. *Borrow permission* is 1 if a fund is allowed to borrow reported in question 70O on Form N-SAR. *Overdraft or bank loan* is 1 if a fund had overdrafts or bank loans outstanding that exceeded 1% of TNA at any time during the reporting period reported in question 55 on Form N-SAR.

	Mean	Std. Dev.	5%	25%	50%	75%	95%
RIK	0.724	0.447	0	0	1	1	1
Flow	-0.189	11.723	-13.723	-4.696	-1.606	2.133	17.496
Fund size	1539	5053	16	86	313	1111	6042
CAPM alpha	-0.004	0.042	-0.076	-0.025	-0.004	0.016	0.064
FF3 alpha	-0.006	0.040	-0.076	-0.023	-0.004	0.013	0.059
Carhart4 alpha	-0.005	0.040	-0.074	-0.023	-0.004	0.014	0.058
Illiquid	0.295	0.456	0	0	0	1	1
Inst	0.212	0.408	0	0	0	0	1
Expense	0.012	0.004	0.006	0.010	0.012	0.015	0.020
Turnover	0.792	0.757	0.110	0.310	0.590	1.000	2.100
% cash	3.098	4.850	-0.240	0.380	1.790	3.980	11.340
Load	0.743	0.437	0	0	1	1	1
Age	182	140	41	97	153	220	456
StdFlow	0.024	0.045	0.001	0.004	0.010	0.022	0.089
Variables from Form N-SAR							
InvstCom size	14234	21755	118	1281	5327	17634	61897
% equity funds	0.861	0.186	0.474	0.750	1	1	1
Borrow permission	0.864	0.343	0	1	1	1	1
Overdraft or bank loan	0.288	0.453	0	0	0	1	1

Table 2: Characteristics associated with different liquidity management tools using SUR approach

This table presents estimation results from equation system (1), which models the choices of various liquidity management tools simultaneously using SUR approach. Observations are at fund-semi-annual level. *RIK* is an indicator variable that equals to one if the fund i's investment company has filed for the exemption before time t, and zero otherwise. *%Cash* is the percentage of fund assets held in cash reported in the CRSPMF database. *Borrow permission* captures the ex-ante permission of borrowing, which takes a value of one if a fund is allowed to borrow, and zero otherwise; *Overdraft or bank loan* captures the ex-post borrowing behavior, which takes a value of one if a fund has overdrafts or bank loans outstanding that exceeds a 1% of net assets at any one time during the reporting period on a Form N-SAR, and zero otherwise. All the independent variables are defined in the Appendix Table A.2 and year dummies are included in all specifications. *t*-statistics are reported in the parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	RIK	% Cash	Borrow permission	Overdraft or bank loan	RIK	% Cash	Borrow permission	Overdraft or bank loan
% equity funds	-0.096**				-0.110**			
	(-2.14)				(-2.38)			
Illiquid	0.075***	0.243*	0.007	0.010	0.064***	0.086	0.009	-0.012
	(4.16)	(1.87)	(0.58)	(0.83)	(3.54)	(0.63)	(0.69)	(-1.08)
Fund characteristics								
InvstCom size					-0.004	-0.111***	0.006*	0.016***
					(-0.80)	(-2.70)	(1.73)	(5.01)
Fund size					-0.008	0.164***	0.009**	-0.042***
					(-1.35)	(3.38)	(2.16)	(-11.42)
Load					0.111***	-0.349**	-0.019	0.016
					(5.35)	(-2.45)	(-1.37)	(1.33)
StdFlow					0.132**	0.482	0.049	0.498***
					(2.13)	(0.62)	(1.27)	(7.59)
Turnover					0.007	0.285**	0.033***	0.059***
					(0.78)	(2.16)	(5.27)	(8.21)
Expense					0.043*	1.197***	-0.018	0.083***
					(1.86)	(5.86)	(-1.09)	(5.35)
Age					-0.039***	-0.729***	-0.014	0.003
					(-2.88)	(-7.31)	(-1.45)	(0.32)
Inst					0.025	-0.104	0.005	0.071***
					(1.23)	(-0.74)	(0.40)	(5.69)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	43,740	43,740	43,740	43,740	42,281	42,281	42,281	42,281
R-sq	0.008	0.005	0.004	0.007	0.033	0.027	0.015	0.072

Breusch-Pagan test of independence	Chi2	722	*p*-value	0.000	Chi2	721	*p*-value	0.000

Correlations in the residuals	RIK	% cash	Borrow permission	Overdraft or bank loan	RIK	% cash	Borrow permission	Overdraft or bank loan
RIK	1				1			
% cash	0.0456***	1			0.036***	1		
Borrow permission	-0.003	-0.013***	1		0.004	-0.011**	1	
Overdraft or bank loan	0.070***	-0.085***	0.048***	1	0.044***	-0.108***	0.046***	1

Table 3. Effects of redemptions in kind on flow-performance sensitivities

This table reports the estimation results of the flow-performance regressions in equation (2). Columns (1) to (3) use the full sample, columns (4) to (6) use the sample of observations with negative performance and columns (7) to (9) use the sample of observations with positive performance. Observations are at fund-month level. The dependent variable is the quarterly net flow. *Perf* is the fund's prior-quarter performance, measured with three variables, CAPM alpha, FF3 alpha, and Carhart4 alpha. All the other variables are defined in Appendix Table A2. All estimations include fund and style×year fixed effects. Standard errors are clustered at the fund level and t-statistics are reported in the parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

	Full sample			Negative performance			Positive performance		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	CAPM	FF3	Carhart4	CAPM	FF3	Carhart4	CAPM	FF3	Carhart4
Perf	0.324***	0.271***	0.233***	0.248***	0.225***	0.189***	0.432***	0.409***	0.299***
	(10.07)	(8.47)	(7.29)	(5.28)	(4.81)	(4.06)	(6.91)	(5.88)	(4.41)
Perf x RIK	-0.054**	-0.042*	-0.038	-0.023	-0.019	0.010	-0.117**	-0.127**	-0.060
	(-2.16)	(-1.71)	(-1.52)	(-0.68)	(-0.57)	(0.29)	(-2.44)	(-2.48)	(-1.20)
Control variable:									
RIK	0.001	0.000	0.001	0.001	-0.002	-0.002	0.005	0.007	0.007
	(0.12)	(0.10)	(0.13)	(0.19)	(-0.36)	(-0.29)	(0.71)	(1.01)	(1.07)
InvstCom size (log)	0.002*	0.002*	0.002*	0.002**	0.002	0.002	0.001	0.002	0.002
	(1.78)	(1.75)	(1.78)	(1.99)	(1.38)	(1.51)	(0.82)	(1.55)	(1.30)
Fund size (log)	-0.023***	-0.023***	-0.023***	-0.021***	-0.022***	-0.022***	-0.022***	-0.021***	-0.021***
	(-17.04)	(-17.04)	(-16.96)	(-14.95)	(-15.48)	(-15.21)	(-12.73)	(-12.57)	(-12.51)
Flow	0.242***	0.243***	0.244***	0.227***	0.233***	0.235***	0.243***	0.236***	0.243***
	(19.83)	(19.93)	(20.00)	(19.79)	(19.73)	(20.01)	(18.51)	(17.73)	(18.65)
Load	0.006	0.006	0.005	0.009*	0.007	0.006	0.004	0.005	0.006
	(1.38)	(1.37)	(1.32)	(1.93)	(1.56)	(1.34)	(0.86)	(0.99)	(1.18)
StdFlow	0.692***	0.693***	0.693***	0.551***	0.575***	0.583***	0.868***	0.856***	0.842***
	(20.51)	(20.53)	(20.53)	(13.05)	(13.92)	(14.25)	(20.57)	(19.28)	(19.34)
Turnover	0.001	0.001	0.001	-0.002	-0.002	-0.001	0.002	0.003	0.002
	(0.54)	(0.53)	(0.48)	(-1.00)	(-1.41)	(-0.46)	(1.19)	(1.48)	(1.09)
Expense	1.454***	1.449***	1.492***	1.671***	1.791***	1.708***	1.558**	1.370**	1.302**
	(2.84)	(2.84)	(2.90)	(2.88)	(3.24)	(3.02)	(2.46)	(2.17)	(2.07)
Age (log)	-0.036***	-0.037***	-0.036***	-0.044***	-0.042***	-0.040***	-0.028***	-0.032***	-0.033***
	(-8.47)	(-8.60)	(-8.51)	(-9.34)	(-9.04)	(-8.68)	(-5.37)	(-6.21)	(-6.53)
Inst	0.009**	0.009**	0.009**	0.013***	0.016***	0.013***	0.007	0.003	0.004
	(2.55)	(2.52)	(2.55)	(3.24)	(3.88)	(3.08)	(1.60)	(0.75)	(0.91)
% Cash	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.000**	0.000	0.000
	(4.71)	(4.75)	(4.70)	(4.70)	(5.32)	(5.93)	(2.17)	(1.49)	(1.58)

Borrow permission	0.003	0.003	0.003	0.003	0.004	0.003	0.005	0.003	0.004
	(1.33)	(1.32)	(1.32)	(0.93)	(1.27)	(1.07)	(1.53)	(0.72)	(1.01)
Overdraft or bank loan	-0.006***	-0.006***	-0.006***	-0.005***	-0.005***	-0.005***	-0.007***	-0.008***	-0.008***
	(-4.96)	(-4.77)	(-4.80)	(-3.13)	(-3.26)	(-2.94)	(-3.65)	(-4.18)	(-4.30)
Perf x Illiquid	0.062***	0.075***	0.071***	0.063**	-0.008	-0.031	0.084*	0.078	0.107**
	(2.62)	(3.17)	(3.03)	(2.04)	(-0.26)	(-0.94)	(1.87)	(1.54)	(2.17)
Perf x Inst	-0.048*	-0.058**	-0.043	-0.003	-0.004	-0.037	-0.127**	-0.132**	-0.038
	(-1.79)	(-2.11)	(-1.56)	(-0.07)	(-0.10)	(-0.83)	(-2.13)	(-2.06)	(-0.64)
Perf x Cash	0.007***	0.006**	0.008***	0.005	0.006*	0.010***	0.004	0.005	0.006
	(2.95)	(2.58)	(3.32)	(1.52)	(1.72)	(2.98)	(0.68)	(0.93)	(1.14)
Perf x Borrow permission	-0.085***	-0.053**	-0.037	-0.041	-0.014	-0.002	-0.109**	-0.057	-0.061
	(-3.03)	(-1.96)	(-1.38)	(-0.97)	(-0.32)	(-0.06)	(-2.14)	(-0.99)	(-1.05)
Perf x Overdraft or bank loan	0.039**	0.041**	0.037*	0.031	0.019	0.030	0.025	0.056	0.038
	(1.98)	(2.10)	(1.88)	(1.06)	(0.61)	(0.97)	(0.59)	(1.31)	(0.92)
Fund and Style×Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	244218	244218	244218	135081	138588	136876	109137	105630	107342
Adj. R-sq	0.201	0.199	0.198	0.156	0.167	0.167	0.229	0.220	0.219

Table 4. Effects of redemptions in kind on flow-performance sensitivities for subsamples

This table reports the estimation results of the flow-performance regressions in equation (2), for subsamples of illiquid funds in columns (1) to (3) and liquid funds in columns (4) to (6). Panel A is for the subsample of observations with negative performance and Panel B is for the subsample of observations with positive performance. The dependent variable is the quarterly net flow. *Perf* is the fund's prior-quarter performance, measured with three variables, CAPM alpha, FF3 alpha, and Carhart4 alpha. All the control variables are the same as in Table 3. All estimations include fund and style×year fixed effects. Standard errors are clustered at the fund level and *t*-statistics are reported in the parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Panel A. Subsample of negative performance

	Illiquid funds			Liquid funds		
	(1)	(2)	(3)	(4)	(5)	(6)
	CAPM	FF3	Carhart4	CAPM	FF3	Carhart4
Perf	0.388***	0.222***	0.275***	0.214***	0.229***	0.148***
	(5.81)	(2.70)	(3.66)	(3.55)	(4.13)	(2.61)
Perf x RIK	-0.093*	-0.136**	-0.140**	0.010	0.021	0.071*
	(-1.83)	(-2.33)	(-2.18)	(0.25)	(0.52)	(1.80)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Fund & Style x year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	41432	40946	40364	93649	97642	96512
Adj. R-sq	0.186	0.193	0.192	0.145	0.157	0.158

Panel B. Subsample of positive performance

	Illiquid funds			Liquid funds		
	(1)	(2)	(3)	(4)	(5)	(6)
	CAPM	FF3	Carhart4	CAPM	FF3	Carhart4
Perf	0.478***	0.399***	0.263**	0.457***	0.466***	0.377***
	(4.43)	(3.27)	(2.17)	(6.02)	(5.36)	(4.62)
Perf x RIK	-0.080	-0.122	-0.042	-0.146**	-0.150**	-0.084
	(-1.01)	(-1.22)	(-0.41)	(-2.44)	(-2.47)	(-1.49)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Fund & Style x year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	33571	34057	34639	76784	72845	73998
Adj. R-sq	0.266	0.254	0.254	0.215	0.205	0.204

Table 5. Effects of redemptions in kind on price pressure

This table reports the estimation results of the price pressure analysis in equations (5). The dependent variable is CAR estimated using four different measures. Columns (1) and (2) use CAR calculated using excess return over the CRSP equal-weighted index return, Columns (3) and (4) use CAR computed with CAPM alpha, Columns (5) and (6) use CAR computed with FF3 alpha, and Columns (7) and (8) use CAR computed with Carhart4 alpha. *MFFlow_RIK* is the price pressure measure for funds with the exemption filing for RIK and *MFFlow_noRIK* is the measure for funds without the exemption filing. The observations are at stock-quarter level. Standard errors are clustered at the stock level. *t*-statistics are reported in the parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

	CAR_EW	CAR_CAPM	CAR_FF3	CAR_Carhart4
	(1)	(2)	(3)	(4)
MFFlow_RIK	-0.0183***	-0.0170***	-0.0162***	-0.0164***
	(-23.20)	(-21.11)	(-20.03)	(-19.83)
MFFlow_noRIK	-0.0466***	-0.0462***	-0.0380***	-0.0373***
	(-17.45)	(-16.96)	(-14.02)	(-13.49)
Quarter FE	Yes	Yes	Yes	Yes
N	110418	109895	109895	109895
Adj. R-sq	0.022	0.033	0.015	0.010
Test press_inkind = Press_noinkind				
p-value	0.000	0.000	0.000	0.000

Table 6. Effects of redemptions in kind on performance-outflow sensitivity

This table reports the estimation results of performance-outflow analysis in equation (6). The dependent variable is quarter performance, measured by CAPM alpha in Column (1), FF3 alpha in Column (2), and Carhart4 alpha in Column (3). *Outflow* is one if the percentage outflow of a fund exceeds 5% of the fund's TNA at the beginning. Number of observations is 265,236 and the observations are at fund-month level. Standard errors are clustered at the fund level. *t*-statistics are reported in the parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

	CAPM alpha (1)	FF3 alpha (2)	Carhart4 alpha (3)
Outflow	-0.0078***	-0.0063***	-0.0059***
	(-10.93)	(-9.57)	(-9.34)
Outflow x RIK	0.0015*	0.0009	0.0011
	(1.78)	(1.23)	(1.46)
Control variable:			
RIK	-0.0014	-0.0003	-0.0013
	(-1.02)	(-0.23)	(-1.13)
Perf (lag)	-0.1107***	-0.0451***	-0.1107***
	(-31.34)	(-8.68)	(-25.05)
Fund size (log)	-0.0061***	-0.0053***	-0.0057***
	(-22.79)	(-21.84)	(-22.59)
Expense	-0.0996	-0.0648	-0.1016
	(-0.91)	(-0.61)	(-0.99)
Turnover	0.0008**	0.0010***	0.0013***
	(2.39)	(3.01)	(4.01)
Age	-0.0029***	0.0004	-0.0005
	(-3.41)	(0.47)	(-0.66)
Inst	0.0010*	0.0008	0.0015***
	(1.71)	(1.38)	(2.77)
Fund and Style×Year FE	Yes	Yes	Yes
Adj. R-sq	0.182	0.166	0.167

Table 7. Descriptive statistics on actual RIK transactions

The sample contains 713 RIK disclosures from 385 funds in their semi-annual and annual financial reports for the fiscal years ended in 2004 to 2012. Data are identified and collected from the Form N-CSR and the Form N-CSRS. Panel A provides the number of disclosures, the average RIK amount and total RIK amount by fiscal year, Panel B provides the frequency of disclosures by funds, and Panel C reports the overall sample descriptive statistics.

Panel A. Descriptive statistics by fiscal year

	N	Average amount ($m)	Total amount ($m)
2004	63	67	4196
2005	68	147	9996
2006	110	133	14630
2007	79	144	11376
2008	118	98	11564
2009	70	94	6601
2010	58	72	4153
2011	67	168	11256
2012	80	169	13520
Total	713		

Panel B. Frequency of disclosures by fund

This panel provides information on frequency of RIK disclosures by each fund over 2004 to 2012.

# of RIK disclosures	# of funds
1	265
2	70
3	21
4 & above	39

Panel C. Summary statistics

This panel provides information on the overall sample summary statistics. *RIK amount ($m)* is the RIK transaction amount in million. *RIK amount / TNA* is RIK amount over funds' TNA. *RIK amount / six-month net dollar flow* is RIK amount over funds' six-month net dollar flow over the same reporting period. *Tax gain associated with RIK ($m)* is tax gains associated with the securities delivered in RIK transaction in million.

	N	Mean	Std. Dev.	5%	25%	50%	75%	95%
RIK amount ($m)	546	119	171	7	17	61	142	308
RIK amount / TNA	541	0.16	0.29	0.01	0.02	0.06	0.18	0.38
RIK amount / six-month net dollar flow	546	0.99	4.43	-0.68	0.02	0.42	0.94	2.43
Tax gains associated with RIK ($m)	689	31	67	0	1	9	37	83

Table 8. Funds' portfolio churning behavior

This table reports the estimation results of the equation (7), which examines mutual funds' trading behavior in response to outflows using 13 F quarterly holdings data. Panel A reports results for year 2004 to 2006, Panel B reports results for years 2007 to 2009, and Panel C reports results for years 2010 to 2012. Columns (1) to (2) are for the quarters without RIK transactions and columns (3) to (4) are for the quarters with RIK transactions. The dependent variable, *Trade*, is the percentage trading in a stock by the fund in a quarter, with split adjustments. *Flow* is the contemporaneous net quarterly flow. *Am_illiqd* is the Amihud illiquidity measure developed in Amihud (2002). *AbSI* is last month abnormal short interest before the beginning of the quarter. Control variables includes % of cash holdings, load, and the interaction terms between flow and these two variables. Observations are at fund-stock-quarter level. Standard errors are clustered at the fund level and t-statistics are reported in the parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

	Fund-quarters without RIK disclosures		Fund-quarters with RIK disclosures	
	(1)	(2)	(3)	(4)
	Trade	Trade	Trade	Trade
Panel A. Year 2004-2006				
Flow	1.125***	1.267***	0.946***	1.103***
	(20.67)	(13.19)	(15.96)	(11.54)
Am_illiqd	0.251**	0.265**	-0.075	-0.024
	(2.84)	(2.76)	(-0.42)	(-0.15)
Flow x Am_illiqd	-0.823	-0.721	-4.780	-4.018
	(-1.08)	(-0.90)	(-1.47)	(-1.42)
ABSI	-0.005***	-0.005***	-0.000	-0.000
	(-8.88)	(-9.05)	(-0.18)	(-0.24)
Flow x ABSI	-0.008	-0.007	0.019	0.021
	(-1.28)	(-1.17)	(1.08)	(1.37)
Control variables	No	Yes	No	Yes
N	729466	722132	17868	17868
Adj. R-sq	0.011	0.011	0.035	0.036

Table 8. (Continued)

Panel B. Year 2007-2009

	Fund-quarters without RIK disclosures		Fund-quarters with RIK disclosures	
	(1)	(2)	(3)	(4)
	Trade	Trade	Trade	Trade
Flow	0.979***	1.058***	0.963***	0.833***
	(19.67)	(13.24)	(5.89)	(3.86)
Am_illiqd	0.247**	0.245**	0.991***	0.930***
	(2.79)	(2.86)	(4.36)	(4.07)
Flow x Am_illiqd	-1.767	-1.631	8.877**	8.050**
	(-1.26)	(-1.12)	(2.32)	(2.38)
ABSI	-0.003***	-0.003***	-0.003	-0.003
	(-6.92)	(-7.02)	(-0.82)	(-0.79)
Flow x ABSI	-0.005	-0.004	0.008	0.010
	(-1.01)	(-0.93)	(0.39)	(0.54)
Control variables	No	Yes	No	Yes
N	962920	961858	16191	16191
Adj. R-sq	0.009	0.009	0.020	0.020

Panel C. Year 2010-2012

	Fund-quarters without RIK disclosures		Fund-quarters with RIK disclosures	
	(1)	(2)	(3)	(4)
	Trade	Trade	Trade	Trade
Flow	0.994***	0.973***	0.869***	1.142***
	(22.63)	(12.04)	(5.35)	(18.12)
Am_illiqd	0.210***	0.148**	-0.236	-0.024
	(4.74)	(2.36)	(-1.01)	(-0.12)
Flow x Am_illiqd	-0.397	-0.829	6.727*	9.363**
	(-0.69)	(-1.18)	(1.77)	(2.49)
ABSI	-0.003***	-0.003***	-0.003	-0.002
	(-6.71)	(-7.41)	(-1.42)	(-1.27)
Flow x ABSI	0.002	0.002	-0.007	0.002
	(0.54)	(0.44)	(-0.62)	(0.20)
Control variables	No	Yes	No	Yes
N	850411	850411	15835	15835
Adj. R-sq	0.009	0.010	0.013	0.022

Appendix A

Table A.1. Comparisons between the matched CRSP/NSAR sample and the CRSP-only sample

	Panel A: matched CRSP/NSAR sample						Panel B: CRSP-only sample					
Year	# of Funds	Average TNA	Average return (%)	Average flow (%)	Expense ratio	Turnover ratio	# of Funds	Average TNA	Average return (%)	Average flow (%)	Expense ratio	Turnover ratio
2006	2743	1097	1.256	0.997	0.013	0.813	3322	1050	1.247	1.006	0.013	0.803
2007	2859	1226	0.711	0.599	0.013	0.821	3427	1169	0.703	0.653	0.013	0.814
2008	2793	1036	-3.545	-0.259	0.013	0.851	3550	980	-3.468	-0.175	0.012	0.850
2009	2646	869	2.509	0.024	0.013	0.949	3356	820	2.458	0.067	0.013	0.948
2010	2505	1083	1.488	-0.094	0.013	0.895	3141	1012	1.483	-0.084	0.013	0.887
2011	2403	1241	-0.347	-0.228	0.012	0.783	3020	1166	-0.352	-0.227	0.012	0.778
2012	2264	1285	1.251	-0.519	0.012	0.735	2825	1213	1.254	-0.485	0.012	0.730
2013	2167	1528	2.088	0.032	0.012	0.675	2694	1441	2.071	-0.012	0.012	0.672
2014	2068	1781	0.477	-0.271	0.012	0.659	2578	1679	0.475	-0.265	0.012	0.659
2015	2024	1803	-0.123	-0.443	0.011	0.631	2513	1705	-0.124	-0.410	0.011	0.629
Total	2966						3928					
Corr.	0.986	1.000	1.000	0.997	0.999	1.000						

Table A.2. Variable definitions
Variables are listed alphabetically.

Variable	Unit	Definition
% cash	Percent	Percentage of fund assets held in cash reported in the CRSPMF database
% equity funds	Decimal	Number of funds over total number of funds within an investment company
Age	Month	Number of months since the fund's inception
Borrow permission	Dummy	1 if a fund is allowed to borrow reported in question 70Q on Form N-SAR
CAPM alpha	Decimal	Quarterly alpha from the CAPM model
Carhart4 alpha	Decimal	Quarterly alpha from the four-factor (the Fama and French three factor and the momentum factor) model
Expense	Decimal	Expense of a fund as a percentage of total assets reported in the CRSPMF database
FF3 alpha	Decimal	Quarterly alpha from the three-factor model
Flow	Percent	Quarterly net flow as a percentage of fund's TNA at the end of last quarter
Fund size	$million	Total asset value of a fund
Illiquid	Dummy	1 if a fund primarily invests in illiquid assets - funds specializing in small-cap, mid-cap, and single-country international stocks (except in UK, Canada, and Japan)
Inst	Dummy	1 if at least 75% of a fund's asset is issued to institutions
InvstCom size	$million	Total asset value of all funds managed by an investment company
Am_illiqd		The Amihud illiquidity measure developed in Amihud (2002)
Load	Dummy	1 if any of a fund share classes charges a front- or back-end load
MFFlow	Decimal	Price pressure induced by mutual fund flow constructed following Edmans, Goldstein, and Jiang (2012)
MFFlow_ RIK	Decimal	Price pressure induced by mutual fund flow for funds with the exemption filing for RIK
MFFlow_noRIK	Decimal	Price pressure induced by mutual fund flow for funds without the exemption filing for RIK
Outflow	Dummy	1 if the percentage outflow of a fund exceeds 5% of the fund's TNA at the beginning
Overdraft or bank loan	Dummy	1 if a fund had overdrafts or bank loans outstanding that exceeded 1% of TNA at any time during the reporting period reported in question 55 on Form N-SAR
RIK	Dummy	1 if a fund has filed for the exemption from certain requirements of section 18(f)(1) for registered open-end investment companies to redeem in kind
Stdflow	Decimal	Standard deviation of a fund's monthly flow
Turnover	Decimal	Turnover ratio of a fund reported in the CRSPMF database

Table A.3. Characteristics associated with redemptions in kind

This table presents results for the determinants of RIK, using logit estimation. Observations are at fund-semi-annual level. The dependent variable, *RIK*, is an indicator variable that equals to one if the fund *i*'s investment company has filed for the exemption before time *t*, and zero otherwise. All the independent variables are defined in the Appendix Table A.2. Year dummies are included in all the specifications. Standard errors are clustered at the fund level. Odds ratios are reported, along with t-statistics in the parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

	(1) RIK	(2) RIK
Asset liquidity measures		
% equity funds	0.620**	0.575**
	(-2.02)	(-2.22)
Illiquid	1.468***	1.410***
	(3.89)	(3.38)
Alternative liquidity management measures		
% Cash	1.026***	1.021***
	(3.94)	(3.18)
Borrow permission	0.927	0.976
	(-0.68)	(-0.21)
Overdraft or bank loan	1.466***	1.292***
	(6.09)	(4.07)
Fund Characteristics		
InvstCom size (log)		0.981
		(-0.68)
Fund size (log)		0.965
		(-1.14)
Load		1.724***
		(5.51)
StdFlow		1.820
		(1.62)
Turnover		1.018
		(0.34)
Expense		1.215
		(1.59)
Age (log)		0.839**
		(-2.53)
Inst		1.112
		(1.00)
Year dummies	Yes	Yes
N	43,740	42,281
pseudo R-sq	0.013	0.031

Table A.4. Matched sample analysis of flow-performance sensitivities

This table reports the estimation results of the flow-performance regressions in equation (2) using a matched sample created by entropy-balanced approach. Panel A shows the differences of fund and family characteristics between treatment and control funds. Panel B reports the results for the full sample. Panel C reports the results for the subsample of illiquid funds and liquid funds. Standard errors are clustered at the fund level and t-statistics are reported in the parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Panel A

	Treatment	Control
% equity funds	0.856	0.856
Illiquid	0.328	0.328
InvtCom size	8.270	8.270
Fund size	5.620	5.620
Load	0.771	0.771
StdFlow	0.025	0.025
Turnover	0.808	0.808
Expense	0.013	0.013
Age	4.919	4.919
Inst	0.215	0.215
% Cash	3.269	3.269
Overdraft or bank loan	0.306	0.306

Panel B

	Full sample			Negative performance			Positive performance		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	CAPM	FF3	Carhart4	CAPM	FF3	Carhart4	CAPM	FF3	Carhart4
Perf	0.295***	0.260***	0.220***	0.233***	0.200***	0.177***	0.366***	0.400***	0.318***
	(7.86)	(6.73)	(5.68)	(4.75)	(3.64)	(3.83)	(5.25)	(5.17)	(4.24)
Perf x RIK	-0.072***	-0.054**	-0.053**	-0.047	-0.041	-0.017	-0.117**	-0.134**	-0.049
	(-2.64)	(-2.10)	(-1.97)	(-1.37)	(-1.11)	(-0.45)	(-2.15)	(-2.38)	(-0.89)
Control variables	As in Table 3			As in Table 3			As in Table 3		
Fund and Style×Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	244132	244132	244132	135038	138542	136834	109094	105590	107298
Adj. R-sq	0.219	0.216	0.215	0.174	0.185	0.183	0.238	0.229	0.231

Table A.4. (continued)
Panel C

	Subsample of negative performance					
	Illiquid funds			Liquid funds		
	(1)	(2)	(3)	(4)	(5)	(6)
	CAPM	FF3	Carhart4	CAPM	FF3	Carhart4
Perf	0.327***	0.176*	0.198***	0.238***	0.235***	0.181***
	(4.30)	(1.67)	(2.60)	(4.17)	(4.45)	(3.30)
Perf x RIK	-0.109**	-0.147**	-0.155**	-0.019	0.006	0.057
	(-2.08)	(-2.51)	(-2.30)	(-0.43)	(0.14)	(1.26)
Control variables		As in Table 3			As in Table 3	
Fund and Style x year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	41411	40925	40346	93627	97617	96488
Adj. R-sq	0.199	0.212	0.208	0.162	0.172	0.172
	Subsample of positive performance					
	Illiquid funds			Liquid funds		
	(1)	(2)	(3)	(4)	(5)	(6)
	CAPM	FF3	Carhart4	CAPM	FF3	Carhart4
Perf	0.380***	0.424***	0.277**	0.440***	0.454***	0.406***
	(3.80)	(3.90)	(2.44)	(5.06)	(4.21)	(4.15)
Perf x RIK	-0.079	-0.098	0.003	-0.166**	-0.177***	-0.100
	(-0.94)	(-0.96)	(0.03)	(-2.44)	(-2.64)	(-1.58)
Control variables		As in Table 3			As in Table 3	
Fund and Style x year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	33559	34045	34624	75535	71545	72674
Adj. R-sq	0.278	0.260	0.259	0.223	0.220	0.222

Table A.5. Funds' portfolio churning behavior

This table reports the estimation results of the equation (7), which examines mutual funds' trading behavior in response to outflows using 13F quarterly holdings data. Panel A reports results for year 2004 to 2006, Panel B reports results for years 2007 to 2009, and Panel C reports results for years 2010 to 2012. Columns (1) to (2) are for the quarters without RIK transactions and columns (3) to (4) are for the quarters with RIK transactions. The dependent variable, *Trade*, is the percentage trading in a stock by the fund in a quarter, with split adjustments. *Flow* is the contemporaneous net quarterly flow. *Am_illiqd* is the Amihud illiquidity measure adjusted by the median of all stocks' illiquidity held in the fund-quarter portfolio. *AbSI* is last month abnormal short interest before the beginning of the quarter, adjusted by the portfolio median. Control variables includes % of cash holdings, load, and the interaction terms between flow and these two variables. Observations are at fund-stock-quarter level. Standard errors are clustered at the fund level and *t*-statistics are reported in the parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

	Fund-quarters without RIK disclosures		Fund-quarters with RIK disclosures	
	(1)	(2)	(3)	(4)
	Trade	Trade	Trade	Trade
Panel A. Year 2004-2006				
Flow	1.129***	1.276***	0.935***	1.083***
	(19.80)	(13.21)	(14.41)	(11.67)
Am_illiqd	0.201**	0.210**	-0.011	0.040
	(2.34)	(2.29)	(-0.06)	(0.23)
Flow x Am_illiqd	-1.259*	-1.208	-3.338	-2.673
	(-1.72)	(-1.59)	(-1.01)	(-0.92)
ABSI	-0.004***	-0.004***	0.000	0.001
	(-9.86)	(-9.78)	(0.13)	(0.29)
Flow x ABSI	-0.007*	-0.007*	0.032**	0.034**
	(-1.65)	(-1.69)	(2.14)	(2.42)
Control variables	No	Yes	No	Yes
N	729466	722132	17868	17868
Adj. R-sq	0.011	0.011	0.035	0.036

Table A.5. (Continued)

Panel B. Year 2007-2009

	Fund-quarters without RIK disclosures		Fund-quarters with RIK disclosures	
	(1)	(2)	(3)	(4)
	Trade	Trade	Trade	Trade
Flow	0.961***	1.041***	1.017***	0.874***
	(17.54)	(12.94)	(5.20)	(3.80)
Am_illiqd	0.171**	0.179**	0.860***	0.811**
	(2.01)	(2.21)	(3.71)	(3.23)
Flow x Am_illiqd	-1.360	-1.176	8.016**	7.336**
	(-1.12)	(-0.94)	(2.39)	(2.38)
ABSI	-0.003***	-0.003***	-0.006	-0.006
	(-9.10)	(-9.03)	(-1.44)	(-1.44)
Flow x ABSI	0.001	0.002	-0.015	-0.012
	(0.38)	(0.48)	(-0.71)	(-0.59)
Control variables	No	Yes	No	Yes
N	962920	961858	16191	16191
Adj. R-sq	0.008	0.009	0.020	0.021

Panel C. Year 2010-2012

	Fund-quarters without RIK disclosures		Fund-quarters with RIK disclosures	
	(1)	(2)	(3)	(4)
	Trade	Trade	Trade	Trade
Flow	0.999***	0.979***	0.844***	1.132***
	(23.79)	(12.14)	(5.48)	(15.79)
Am_illiqd	0.203***	0.143**	-0.173	0.010
	(4.88)	(2.28)	(-0.83)	(0.05)
Flow x Am_illiqd	-0.294	-0.734	8.204**	10.270**
	(-0.49)	(-1.00)	(2.10)	(2.61)
ABSI	-0.003***	-0.003***	-0.001	-0.001
	(-9.04)	(-9.36)	(-0.53)	(-0.44)
Flow x ABSI	-0.001	-0.001	0.010	0.013
	(-0.14)	(-0.20)	(0.76)	(1.03)
Control variables	No	Yes	No	Yes
N	850411	850411	15835	15835
Adj. R-sq	0.009	0.010	0.013	0.021

Table A.6. Flow-performance analysis using RIK usage information

This table conducts the same flow-performance analysis as in Table 4 using the sample of funds that have used RIK during year 2004 to 2012 and funds that have never filed the exemption under Rule 18f1. *RIK_user* is 1 if the fund has used RIK during year 2004 to 2012. Standard errors are clustered at the fund level and t-statistics are reported in the parentheses, where *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

	Subsample of negative performance					
	Illiquid funds			Liquid funds		
	(1)	(2)	(3)	(1)	(2)	(3)
	CAPM	FF3	Carhart4	CAPM	FF3	Carhart4
Perf	0.366***	0.281*	0.344***	0.189**	0.184**	0.213***
	(3.41)	(1.82)	(3.29)	(2.31)	(2.53)	(3.28)
Perf x RIK_user	-0.160*	-0.269***	-0.283***	0.076	0.030	0.067
	(-1.97)	(-3.12)	(-3.02)	(1.23)	(0.44)	(1.12)
Control variables	As in Table 3			As in Table 3		
Fund and Style x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	13835	13716	13571	35813	37364	37048
Adj. R-sq	0.199	0.204	0.198	0.173	0.179	0.180

	Subsample of positive performance					
	Illiquid funds			Liquid funds		
	(1)	(2)	(3)	(1)	(2)	(3)
	CAPM	FF3	Carhart4	CAPM	FF3	Carhart4
Perf	0.361***	0.377***	0.391***	0.385***	0.472***	0.510***
	(2.87)	(2.63)	(2.72)	(3.43)	(3.25)	(3.58)
Perf x RIK_user	-0.106	-0.248*	-0.113	-0.130	-0.158*	-0.014
	(-0.80)	(-1.67)	(-0.73)	(-1.49)	(-1.71)	(-0.15)
Control variables	As in Table 3			As in Table 3		
Fund and Style x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	11548	11667	11812	29214	27663	27979
Adj. R-sq	0.249	0.241	0.245	0.211	0.212	0.212

Appendix B Tax treatment in RIK

This Appendix provides a simplified example to illustrate the tax consequences associated with RIK. At the fund level, tax is deferred until the remaining shareholders sell their fund shares. At the redeeming shareholder level, the tax treatment is the same as if the shareholder redeemed in cash.

Example. At time T1, Investor 1 buys 1 share of a fund at a NAV of 90. At time T2, fund share appreciates to 100 and Investor 2 buys 1 share. At time T3, fund share appreciates to 120 and Investor 1 redeems 1 share at 120. The following tables outline what happens with redemptions in cash and RIK.

Redemptions in cash case

	Fund NAV	Fund portfolio	Investor 1	Investor 2
T 1	90	1 shr @ 90 (basis 90)	Owns 1 share	
T 2	100	2 shr @ 100 (basis 190)	Owns 1 share	Owns 1 share
T 3	90[16]	1 shr @ 120 (sell one with basis of 90 with realized capital gain of 30 distributed to investor 2)	Redeems 1 share in cash (pay tax on $30, i.e., 120-90)	Owns 1 share ($30 distributed realized capital gain[17])
T 4	90	Sell @ 90		Redeem in cash (tax loss of -$10=90-100)

RIK case

	Fund NAV	Fund portfolio	Investor 1	Investor 2
T 1	90	1 shr @ 90 (basis 90)	Owns 1 share	
T 2	100	2 shr @ 100 (basis 190)	Owns 1 share	Owns 1 share
T 3	120	1 shr @ 120 (fund deliver the one with basis of 90)	Redeem 1 share in kind (pay tax on $30, i.e., 120-90)	Owns 1 share (no tax event)
T 4	120	Sell @ 120		Redeem in cash ($20 realized capital gain)

For the remaining Investor 2, at time T3, the redemptions in cash example has a $30 realized capital gain while the RIK example doesn't have any tax event. However, the total tax liability for investor 2 in both cases is $20 (the sum of $30 realized capital gain at time T3 and $10 realized capital loss at time T4). The only difference is the timing in tax.

For the redeeming Investor 1, at time T3, the tax effect is the same in the case of cash redemptions and the RIK case.

[16] https://www.investopedia.com/terms/c/capitalgainsdistribution.asp. "As is the case with common stocks, the distribution of capital gains and dividends decreases the net asset value (NAV) of the fund by the amount distributed."
[17] Dickson, Shoven, and Sialm (2000): The distribution of the realized gains (to the extent they are not reinvested in additional fund shares) would also be a negative cash flow event that could force further realizations.

Appendix C Examples of RIK disclosures in Form N-CSR and Form N-CSRS

1. T. Rowe Price Small-Cap Stock Fund

https://www.sec.gov/Archives/edgar/data/75170/000007517008000003/arscs.htm

"**In-Kind Redemptions** In accordance with guidelines described in the fund's prospectus, the fund may distribute portfolio securities rather than cash as payment for a redemption of fund shares (in-kind redemption). For financial reporting purposes, the fund recognizes a gain on in-kind redemptions to the extent the value of the distributed securities on the date of redemption exceeds the cost of those securities. 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. During the year ended December 31, 2007, the fund realized $37,090,000 of net gain on $103,986,000 of in-kind redemptions."

2. Putnam Global Equity Fund

https://www.sec.gov/Archives/edgar/data/81251/000092881606001553/a_globequityfnd.htm

"For the year ended October 31, 2006, the fund had redemptions in kind totaling $360,562,936.

Net realized gain on investments (including $55,683,088 from redemptions in kind) (Notes 1 and 3) 356,448,373"

3. Sequoia Fund

https://www.sec.gov/Archives/edgar/data/89043/000008904311000002/ncsr.txt

"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 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.

During the year ended December 31, 2010 permanent differences primarily due to realized gains on redemptions in kind not recognized for tax purposes and different book and tax treatment of net realized gains on foreign currency transactions resulted in a net decrease in undistributed net realized gains of $42,735,019 with a corresponding increase in paid in surplus of $42,706,615, and an increase to undistributed net investment income of $28,404. These reclassifications had no effect on net assets. "

4. Royce Special Equity Fund

https://www.sec.gov/Archives/edgar/data/709364/000094937711000136/d27922.htm

"The Funds may make payment for Fund shares redeemed wholly or in part by distributing portfolio securities to shareholders. For the year ended December 31, 2010, Royce Special Equity Fund had redemptions-in-kind with total proceeds in the amount of $7,257,223. The net realized gain on these redemptions-in-kind amounted to $184,263, which will not be realized for tax purposes."

5. Prudential Strategic Partners International Value Fund

https://www.sec.gov/Archives/edgar/data/741350/000119312505250597/dncsr.htm
"Note 9. In-Kind Redemption

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."

6. Eaton Vance Tax-managed value fund
https://www.sec.gov/Archives/edgar/data/745463/000119312512519243/d452276dncsr.htm

"1) Includes $2,904,269 of net realized gains from redemptions in-kind."

7. Excelsior Small Cap Fund

https://www.sec.gov/Archives/edgar/data/751200/000119312505123510/dncsr.htm

	Small Cap Fund			
	Year Ended 03/31/05		Year Ended 03/31/04	
	Shares	Amounts	Shares	Amounts
Redemption in-kind	(1,099,692)	(18,595,792)	—	—

8. VANGUARD QUANTITATIVE FUNDS Structured Large-Cap Equity Fund

https://www.sec.gov/Archives/edgar/data/799127/000093247109001082/quantitativefundsfinal.htm

"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."