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journal homepage: [www.elsevier.com/locate/jmoneco](http://www.elsevier.com/locate/jmoneco)Redemption risk and cash hoarding by asset managers<sup>☆</sup>Stephen Morris<sup>a</sup>, Ilhyock Shim<sup>b,\*</sup>, Hyun Song Shin<sup>c</sup><sup>a</sup>Princeton University, Princeton, NJ, United States<sup>b</sup>Monetary and Economic Department, Bank for International Settlements, 78F, Two International Finance Centre, 8 Finance Street, Central, Hong Kong Special Administrative Region<sup>c</sup>Monetary and Economic Department, Bank for International Settlements, Centralbahnplatz 2, Basel, Switzerland

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## ABSTRACT

Open-end mutual funds face investor redemptions, but the sale of the underlying assets depends on asset managers' portfolio decisions. If asset managers use cash holdings as a buffer to meet redemptions, they can mitigate fire sales of the assets. If they hoard cash in response to redemptions, they will amplify fire sales. We present a global game model of investor runs and identify conditions under which asset managers hoard cash. In an empirical investigation of bond mutual funds, we find that cash hoarding is the rule rather than the exception, and that less liquid bond funds display stronger cash hoarding.

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## 1. Introduction

Our understanding of crisis propagation is heavily influenced by the experience of the 2008 crisis. Banks have been the focus of attention, and the watchwords have been leverage, maturity mismatch, complexity and insolvency.

Discussions of financial stability have also revolved around market liquidity, and actions of asset managers in the face of redemptions by ultimate investors. The concern has been with evaporating market liquidity and “one-sided markets” in the face of concerted investor redemptions. The recent proposals by the Securities and Exchange Commission (SEC) and the Financial Stability Board (FSB) on the asset management sector have addressed the possible financial stability implications of market disruption.<sup>1</sup>

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<sup>1</sup> See FSB (2015), FSB (2016) and the SEC report “Open-End Fund Liquidity Risk Management Programs; Swing Pricing; Re-Opening of Comment Period for Investment Company Reporting Modernization Release”, <http://www.sec.gov/rules/proposed/2015/33-9922.pdf>.

While banks are financed with debt claims, mutual funds have shares, so that the problem of insolvency is less prominent in discussions of the financial stability consequences of asset managers. Instead, two mechanisms involving strategic complementarities have been flagged as potential sources of financial instability. One is the possibility that collective investment vehicles such as open-end bond mutual funds may be vulnerable to concerted redemption flows by investors in “run-like” episodes (Goldstein et al., 2016; Chen et al., 2010). This mechanism has figured prominently in the policy debates (see FSB, 2015; and FSB, 2016). The second mechanism discussed in the literature is concerned with the interactions across asset managers arising from competition for fund flows. When decision horizons are shortened due to short-term performance evaluation, strategic elements may enter into portfolio decisions (see Feroli et al., 2014; and Morris and Shin, 2016).

Our paper is concerned with a third dimension to the debate, to do with liquidity management by asset managers in their interactions with ultimate investors. If asset managers use their cash holdings as a buffer to meet investor redemptions, they can deal with redemptions without resorting to the sale of the underlying assets. Such behaviour would be consistent with a “pecking order” choice of actions where asset managers draw on cash first, and only start to sell the underlying assets if the cash runs out. The pecking order mode of liquidity management implies that cash holdings of asset managers decrease in the face of investor redemptions, and serve to stabilise price fluctuations associated with concerted redemptions by investors.

However, if asset managers increase their cash holdings in the face of investor redemptions, they will need to sell more of the underlying assets than is strictly necessary to meet investor redemptions. We label this type of liquidity management as “cash hoarding”. In contrast to the pecking order mode of liquidity management, cash hoarding implies a positive association between cash and investor redemptions. Cash hoarding may potentially reinforce the impact of investor redemptions by amplifying the sales of the underlying asset.

Our paper asks whether cash hoarding or the pecking order mode of liquidity management is the norm. It combines a theoretical investigation with an empirical analysis. We first gain insights from a global game analysis of investor runs to set the stage for our empirical investigation. Our global game analysis identifies conditions under which cash hoarding by the asset manager takes place.

As a transition to our empirical analysis, we lay out a methodology for classifying purchases and sales of the underlying assets of an open-end mutual fund into those driven by investor flows and those that are discretionary. Our methodology for the classification of discretionary sales allows us to examine a large dataset of global bond mutual funds to ascertain whether the portfolio decision of the asset managers conforms to the pecking order model where cash holdings are used as a buffer to smooth shocks coming from redemptions, or whether the asset managers engage in cash hoarding so as to amplify the fire sale of assets that results from redemptions.

The results from our empirical investigation show that cash hoarding is the rule rather than the exception. Discretionary sales of the underlying asset tend to reinforce the investor redemption-driven sales. As a rule of thumb, for every 100 dollars' worth of sales due to investor redemptions, there is an additional 10 dollars' worth of discretionary sales. A corollary is that mutual fund holding of cash is actually increasing in the incidence of investor redemptions. We find that mutual funds that hold more illiquid bonds—such as emerging market economy (EME) local currency sovereign bonds and EME corporate bonds—tend to have more pronounced cash hoarding. Cash hoarding is also a feature of advanced economy bond funds, but the magnitudes are much smaller—around 3 dollars' worth of discretionary sales for every 100 dollars' worth of investor-driven sales.

We find that the more liquid are the underlying bonds, the smaller is the incidence of cash hoarding. These findings are consistent with the results reported in Jiang et al. (2016) and Chernenko and Sunderam (2016) who examine mutual funds investing in US corporate bonds—bonds which are more liquid than non-US bonds and especially so compared to EME bonds.<sup>2</sup>

Finally, we find evidence of asymmetry between discretionary purchases and discretionary sales. The positive relationship between investor-driven sales and discretionary sales is stronger than the corresponding relationship between investor-driven purchases and discretionary purchases. Similarly, Girardi et al. (2016) show that during crisis or market stress periods, US corporate bond funds tend to hoard cash, but that they do not hoard cash during normal times.

Our results on cash hoarding provide a benchmark in evaluations of the financial stability consequences of open-end funds. However, the overall impact of cash hoarding on market disruptions needs to take account of the endogeneity of the redemption decisions by investors. If investors are less prone to run-like behaviour when the fund holds large cash balances, there is an intertemporal dimension to liquidity management, as developed in Zeng (2016). To the extent that investors are less likely to pull out when faced with higher cash balances, the fund manager may curtail future redemptions by increasing the cash holding today. Nevertheless, the fund manager may face a delicate balancing act between selling too much into an illiquid market, thereby reducing net asset value, and securing enough cash to meet future redemption pressures and defusing the run-like incentives. Our global game model highlights the countervailing effects.

<sup>2</sup> In addition, the average credit rating of US corporate bonds (A–) is higher than the average credit ratings of the four key benchmark indexes (AA–, BBB–, BBB+ and BBB) for the four types of bond fund considered in our paper.

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