CHAPTER 3

THE ASSET MANAGEMENT INDUSTRY AND FINANCIAL STABILITY

SUMMARY

Financial intermediation through asset management firms has many benefits. It helps investors diversify their assets more easily and can provide financing to the real economy as a "spare tire" even when banks are distressed. The industry also has various advantages over banks from a financial stability point of view.

Nonetheless, concerns about potential financial stability risks posed by the asset management industry have increased recently as a result of that sector's growth and of structural changes in financial systems. Bond funds have grown significantly, funds have been investing in less liquid assets, and the volume of investment products offered to the general public in advanced economies has expanded substantially. Risks from some segments of the industry—leveraged hedge funds and money market funds—are already widely recognized.

However, opinions are divided about the nature and magnitude of any associated risks from less leveraged, "plain-vanilla" investment products such as mutual funds and exchange-traded funds. This chapter examines systemic risks related to these products conceptually and empirically.

In principle, even these plain-vanilla funds can pose financial stability risks. The delegation of day-to-day portfolio management introduces incentive problems between end investors and portfolio managers, which can encourage destabilizing behavior and amplify shocks. Easy redemption options and the presence of a "first-mover" advantage can create risks of a run, and the resulting price dynamics can spread to other parts of the financial system through funding markets and balance sheet and collateral channels.

The empirical analysis finds evidence for many of these risk-creating mechanisms, although their importance varies across asset markets. Mutual fund investments appear to affect asset price dynamics, at least in less liquid markets. Various factors, such as certain fund share pricing rules, create a first-mover advantage, particularly for funds with high liquidity mismatches. Furthermore, incentive problems matter: herding among portfolio managers is prevalent and increasing.

The chapter does not aim to provide a final verdict on the overall systemic importance of the potential risks or to answer the question of whether some asset management companies should be designated as systemically important. However, the analysis shows that larger funds and funds managed by larger asset management companies do not necessarily contribute more to systemic risk: the investment *focus* appears to be relatively more important for their contribution to systemic risk.

Oversight of the industry should be strengthened, with better microprudential supervision of risks and through the adoption of a macroprudential orientation. Securities regulators should shift to a more hands-on supervisory model, supported by global standards on supervision and better data and risk indicators. The roles and adequacy of existing risk management tools, including liquidity requirements, fees, and fund share pricing rules, should be reexamined, taking into account the industry's role in systemic risk and the diversity of its products.

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Introduction

In recent years, credit intermediation has been shifting from the banking to the nonbank sector, including the asset management industry.[1] Tighter regulations on banks, rising compliance costs, and continued bank balance sheet deleveraging following the global financial crisis have contributed to this shift. In advanced economies, the asset management industry has been playing an increasingly important role in the financial system, especially through increased credit intermediation by bond funds.[2] For emerging markets, portfolio flows—many of which are channeled through funds—have shown steady growth since the crisis. Globally, the industry now intermediates assets amounting to $76 trillion (100 percent of world GDP and 40 percent of global financial assets; Figure 3.1).

The larger role of the asset management industry in intermediation has many benefits. It helps investors diversify their assets more easily and can provide financing to the real economy as a "spare tire" even when banks are distressed. The industry also has advantages over banks from a financial stability point of view. Banks are predominantly financed with short-term debt, exposing them to both solvency and liquidity risks. In contrast, most investment funds issue shares, and end investors bear all investment risk (see Figure 3.2, and see Annex 3.1 for a primer on the industry). High leverage is mostly limited to hedge funds and private equity funds, which represent a small share of the industry.[3] Therefore, solvency risk is low in

[1]In this chapter, the definition of the asset management industry includes various investment vehicles (such as mutual funds, exchange-traded funds, money market funds, private equity funds, and hedge funds) and their management companies (see Annex 3.1). Pension funds and insurance companies are excluded, as are other types of nonbank financial institutions.

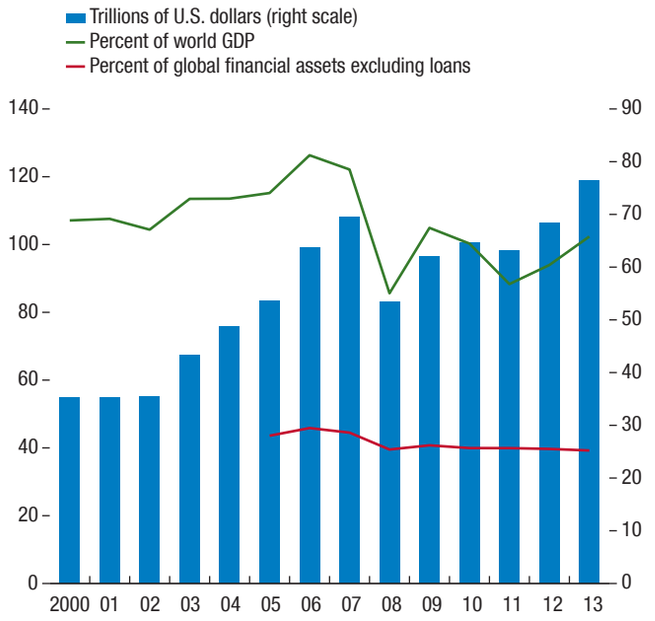
[2]See October 2014 *Global Financial Stability Report*.

[3]However, these funds can still be a source of systemic risk, as shown during the Long-Term Capital Management episode in 1998. Mutual funds and exchange-traded funds do incur portfolio leverage

Figure 3.1. Financial Intermediation by the Asset Management Industry Worldwide

The asset management industry intermediates substantial amounts of money in the financial system.

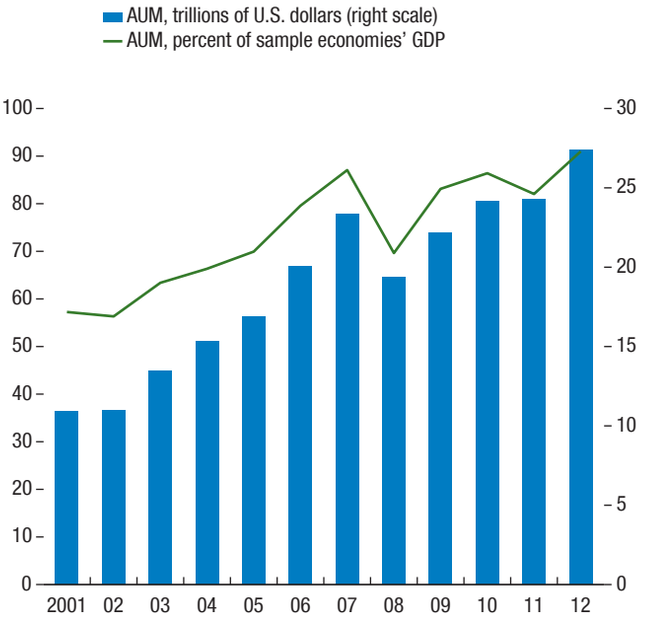
1. World Top 500 Asset Managers' Assets under Management[1]



Sources: Bloomberg, L.P.; McKinsey (2013); Pensions and Investments and Towers Watson (2014); IMF, World Economic Outlook database; and IMF staff estimates.
[1]The change of asset under management is determined both by valuation changes of underlying assets as well as net inflows to funds.

The growth of investment funds has been particularly pronounced among advanced economies during the past decade.

2. Size of Investment Funds in Selected Advanced Economies

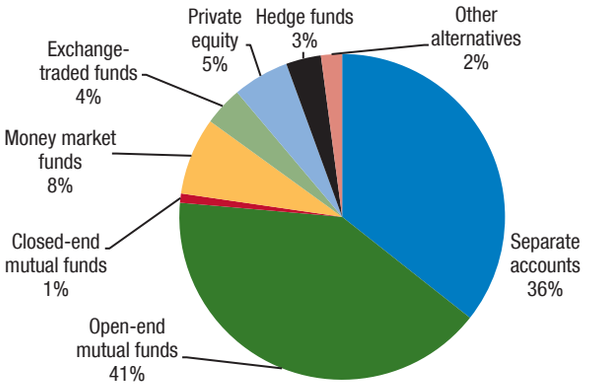


Sources: Organisation for Economic Co-operation and Development; and IMF World Economic Outlook database.
Note: AUM = assets under management. Economies comprise Canada, Germany, Ireland, Japan, Luxembourg, United Kingdom, and United States. Investment funds include mutual funds, money market funds, and exchange-traded funds.

Figure 3.2. Products Offered by Asset Managers and Their Recent Growth

Plain-vanilla products and privately offered separate account services dominate the markets as measured by assets under management.

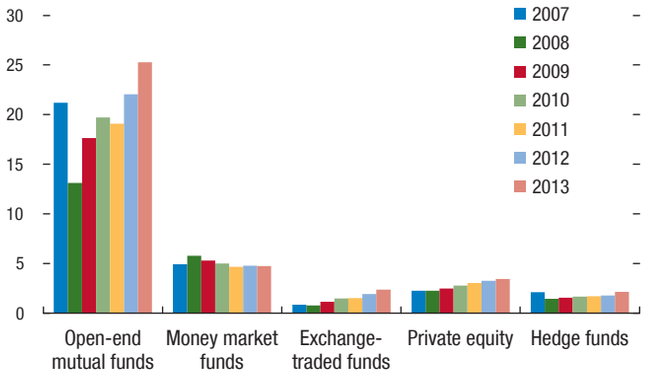
1. Asset Managers' Intermediation by Investment Vehicles (Percent of $79 trillion total assets under management, end-2013)



Sources: BarclayHedge; European Fund and Asset Management Association; ETFGI; Organisation for Economic Co-operation and Development; Pensions and Investments and Towers Watson (2014); Preqin; and IMF staff estimates.

Open-end funds, exchange-traded funds, and private equity funds have shown strong growth since the global financial crisis.

2. Recent Growth of Selected Investment Vehicles (Assets under management in trillions of U.S. dollars)



Sources: BarclayHedge; European Fund and Asset Management Association; Organisation for Economic Co-operation and Development; Preqin; and IMF staff calculations.

most cases (see October 2014 *Global Financial Stability Report*). Intermediation through funds also brings funding cost benefits and fewer restrictions for firms compared with bank financing—it does, however, also expose firms to more volatile funding conditions, so the advantages have to be weighed against the risks.

Nevertheless, the growth of the industry has given rise to concerns about potential risks.[4] By now, the assets under management of top asset management companies (AMCs) are as large as those of the largest banks, and they show similar levels of concentration.[5] For emerging markets, the behavior of fund flows has for some time been a key financial stability concern, as extensively discussed in the April 2014 *Global Financial Stability Report*. Similarly, risks from hedge funds and money market funds are already well recognized. However, the importance of "plain-vanilla" products is less well understood (Feroli and others 2014). At the individual fund level, plain-vanilla funds face liquidity risk: the shares of open-end mutual funds and exchange-traded funds are usually redeemable or tradable daily, whereas assets can be much less liquid. However, the extent to which such risks at the level of an individual institution can translate into systemic risk is subject to ongoing research and debate.

Potential systemic risks from less leveraged segments of the industry are likely to stem from price externalities in financial markets and their macro-financial consequences. Systemically important effects may arise if features of the industry tend to amplify shocks or increase the likelihood of destabilizing price dynamics in certain asset markets compared with a situation in which investors invest directly in securities. These effects can have broader economic implications. For example, if intermediation through funds raises the probability of fire sales of bonds that are held by key players in the financial sector or that are used as collateral, then the risk of destabilizing knock-on effects on other institutions rises, with potentially important macro-financial consequences. Similarly, if funds exacerbate the volatility of capital flows in and out of

through derivatives and securities lending, about which only limited information is disclosed. However, most publicly offered products have regulatory leverage caps that are generally much lower than those for banks (see Table 3.1).

[4]A report by the Office of Financial Research (2013) summarizing potential systemic risks emanating from the industry spurred an active discussion among academics, supervisors, and the industry. A large number of qualitative analyses on this topic (CEPS-ECMI 2012; Elliott 2014; Haldane 2014) are available, but comprehensive, data-based evidence is still limited.

[5]In this chapter, the term AMC does not include asset management companies set up to handle distressed assets in the context of bank restructuring and resolution.

emerging markets or increase the likelihood of contagion, significant consequences will be endured by the recipient economies.[6]

Some key features of collective investment vehicles may give rise to such destabilizing dynamics compared with a situation without intermediaries. Conceptually, it is important to distinguish clearly between the types of risks that result from the presence of intermediaries and those that are merely a reflection of the behavior of end investors and would occur in the absence of intermediaries (Elliott 2014). Two main risk channels that are important in this context, even for unleveraged funds, are (1) incentive problems related to the delegation of portfolio management decisions by end investors to funds, which, among other things, may lead to herding, and (2) a first-mover advantage for end investors (that is, incentives not to be the last in the queue if others are redeeming from a fund), which may result in fire-sale dynamics. These issues are discussed in detail in this chapter.

In recent years, the importance of such risks is likely to have risen in advanced economies because of structural changes in their financial systems. Not only has the relative importance of the asset management industry grown, but banks have also retrenched from many market-making activities, possibly contributing to a reduction in market liquidity (October 2014 *Global Financial Stability Report*). Consequently, large-scale trading by funds could potentially have a larger effect on markets than in the past. Moreover, the role of fixed-income funds has expanded considerably—and price disruptions in fixed-income markets have potentially larger consequences than large price swings in equity markets. The volume of products offered to the general public in advanced economies has grown considerably.[7] Finally, the prolonged period of low interest rates in advanced economies has resulted in a search for yield, which has led funds to invest in less liquid assets, and is likely to have exacerbated the risks described above (October 2014 *Global Financial Stability Report*).

These considerations have sparked a policy discussion about intensifying oversight across advanced and emerging economies. In 2014, the Financial Stability Board (FSB) and International Organization of Securities Commissions (IOSCO) proposed assessment methodologies to identify investment funds that might be global systemically important financial institutions (G-SIFIs) and as such would be regulated differently from the others (FSB and IOSCO 2014). This proposal was revised in March 2015, and includes approaches for identifying both investment funds and asset managers as G-SIFIs (FSB and IOSCO 2015). Market regulators in major jurisdictions (Figure 3.3), such as the U.S. Securities and Exchange Commission (SEC), are considering revising their approach to the oversight of asset managers and the products they offer, including through stress testing requirements. This is a paradigm shift. Until recently, securities regulators have mainly focused on investor protection, with limited attention to financial stability risks.

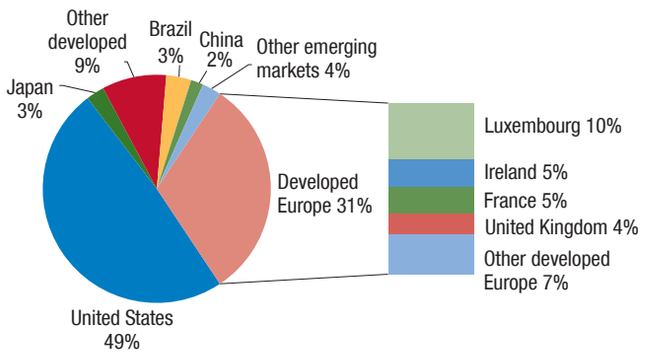
This chapter aims to shed more light on the empirical relevance of these issues, thereby contributing to the understanding of the systemic risk implications of the asset management industry. This task is challenging given that the risks of concern have not yet or only partially materialized in advanced economies; inference, therefore, often has to be indirect. So far, the literature has only examined partial aspects of these problems in individual markets. This chapter provides an account of key risk profiles of the largest segments in the industry and an in-depth, original, data-based analysis of some of

[6]Other risks include operational risks and risks related to securities lending, which are not discussed in detail in this chapter. See Cetorelli (2014).

[7]Retail investors are often seen to be less sophisticated and informed than institutional investors, and more prone to chase returns (Frazzini and Lamont 2008). This possibly exacerbates the incentive problems mentioned earlier.

Figure 3.3. Key Domiciles of Mutual Funds
(Mutual funds by domicile, percent of total assets under management, end-2014)

The mutual fund industry is dominated by U.S. and European funds. Among emerging market economies, Brazil has the largest fund sector.



Sources: European Fund and Asset Management Association; and IMF staff calculations.

the main issues featured in the public discussion, backed by interviews with asset managers and supervisors. The key questions are the following:

- What are the potential sources of financial stability risks from the asset management industry, particularly from the less leveraged, plain-vanilla segments?
- What is the empirical evidence on the various specific risk channels?
- What existing internal risk management and oversight tools can be used to mitigate financial stability risks? What needs to be done to better monitor and mitigate these risks?

The detailed empirical analysis finds evidence for many mechanisms through which funds can create and amplify risks, although their importance varies across asset markets:

- Mutual fund investments appear to affect asset price dynamics, at least in less liquid markets. The impact, however, does not seem to have risen over time. Assets that are held in a concentrated manner by funds perform worse during periods of stress.
- Various factors create run risk, including certain fund share pricing rules. To some extent, however, risks are mitigated by funds' liquidity management.
- The evidence points to the importance of incentive problems between end investors and portfolio managers. Herding among U.S. mutual funds has been rising across asset markets, particularly among retail-oriented funds (whose end investors are more fickle and for whom assessing the skills of portfolio managers is more difficult). The patterns of fund inflows by end investors also encourage poorly performing portfolio managers to take excessive risks.
- However, larger funds and funds belonging to larger AMCs do not necessarily contribute more to systemic risk. The investment *focus* appears to be relatively more important than *size* when gauging systemic risk.

Overall, the evidence calls for strengthening the microprudential supervision of risks and adopting macroprudential oversight of the industry:

- Currently, most securities regulators focus on investor protection and do not intensively supervise risks of individual institutions with the help of risk indicators or stress tests. This practice needs to be changed, supported by global standards on microprudential supervision and more comprehensive data.
- Moreover, macroprudential oversight frameworks should be established to address financial stability risks stemming from the industry. These stability risks originate in price externalities that can be missed by microprudential regulators and asset managers.
- The roles and adequacy of existing risk management tools, including liquidity requirements, fees, and fund share pricing rules, should be reexamined, taking into account the industry's role in systemic risk and the diversity of its products.

The chapter first lays out conceptual issues related to the nature of potential financial stability risks from the industry. Next, various empirical exercises are conducted to identify different behavioral patterns of mutual fund investors and their financial stability implications. The chapter then examines the industry's oversight framework and makes recommendations for reducing financial stability risks.

Financial Stability Risks of Plain-Vanilla Funds: Conceptual Issues

Plain-vanilla mutual funds and ETFs—the largest segment of the industry—do not suffer much from the known vulnerabilities of hedge funds and money market funds. Reforms are already underway to address risks related to hedge funds (which can incur high leverage and engage in complex strategies with few disclosure requirements) and money market funds (some of which offer redemptions at a constant nominal value per fund share, making their liabilities similar to deposits and vulnerable to runs). In general, these specific risks apply less to typical mutual funds and ETFs (Table 3.1 and Annex 3.1).

Risk Transmission Channels

Intermediation through plain-vanilla funds is, however, not risk free (Figure 3.4):[8]

[8]Apart from Table 3.1 and Annex 3.1, this chapter does not cover separate accounts in detail because of data limitations. However, SIFMA (2014) indicates that these accounts mainly invest in simple securities portfolios with little leverage. For pension fund and insurance company investors, separate accounts are bound by overall investment restrictions set by their respective regulators. Redemption risks appear to be limited as well because institutional investors tend to internalize the cost of their sales, and large redemptions can be settled in kind.

Table 3.1. Summary Characteristics and Risk Profiles of Major Investment Vehicles

Vehicle	2013 AUM (trillions of U.S. dollars)	Publicly Offered	Collective Investment Schemes	Typical Redemption and Trading Practice	Typical Settlement Method	Solvency Risk	Leverage through Borrowing[1,2]	Portfolio Leverage[2] (Derivatives)	Main Investor Clientele	Disclosure Gap[3]
Open-End Mutual Fund	25	Yes	Yes	End of day	Cash	Low	Possible with cap	Yes with cap	Retail, institutional	Low
Closed-End Mutual Fund	0.5	Yes	Yes	N.A. (primary) Intraday (secondary)	Cash	Low	Some yes with cap	Yes with cap	Retail, institutional	Low
Money Market Fund	4.8	Yes	Yes	End of day	Cash	Low	Possible with cap	Yes with cap	Retail, institutional	Low
Exchange-Traded Fund	2.3	Yes	Yes	Infrequent (primary) Intraday (secondary)	In kind (primary) Cash (secondary)	Low	Possible with cap	Yes with cap	Retail, institutional	Low
Synthetic ETF	0.1[4]				Cash	Low	Possible with cap	High derivative use	Institutional	
Private Equity Fund	3.5	No	Yes	N.A. (closed-end with long-term finite life)	Cash	High[5]	Some yes, no cap	No information	Institutional	Medium
Hedge Fund	2.2	No	Yes	Quarterly + lock-up period + 90 days advance notice	Cash	High[5]	High no cap	High no cap	Institutional	Medium
Separate Account[6]	22[7]	No	No	No information	Cash or in kind	Low	No information[8]	No information[8]	Institutional	High

Sources: BarclayHedge; Deutsche Bank (2014); ETFGI; EFAMA (2014); ICI (2014a, 2014c); McKinsey (2013); Metrick and Yasuda (2011); Morningstar (2012); OFR (2013); Preqin; PriceWaterhouseCoopers (2013); and IMF staff estimates.

Note: AUM = assets under management; ETF = exchange-traded fund; N.A. = not applicable.

[1]Borrowing includes issuing debt or taking bank loans.

[2]No cap means no regulatory cap, and with cap means there are regulatory caps on the leverage. For public funds in the United States, leverage is capped at 33 percent of assets including portfolio leverage. European Undertakings for Collective Investment in Transferable Securities (UCITS) funds can borrow up to 10 percent of assets, but only temporary borrowing is allowed and it should not be used for investment.

[3]Disclosure in this column is about securities, borrowing through loans, and cash holdings information. Across all products, there is very little information about derivatives and securities financing transactions (repurchase agreements and securities lending transactions), their counterparties, and collateral.

[4]The figure covers European-listed synthetic exchange-traded funds. Synthetic products are mainly seen in Europe and to a lesser extent in Asia. See Annex Table 3.1.1 for a description of synthetic products.

[5]In addition to taking leverage, these types of funds risk their own capital and balance sheets when investing given that they comingle client investors' money with their own money for investment.

[6]This is different from "separate account" used among insurance companies. See Annex Table 3.1.1 for description.

[7]The figure is based on the U.S. data reported in OFR (2013) and the European data reported in EFAMA (2014).

[8]Investment strategy should be in line with the mandate set by clients and their regulatory requirements (such as insurance and pension fund regulations).

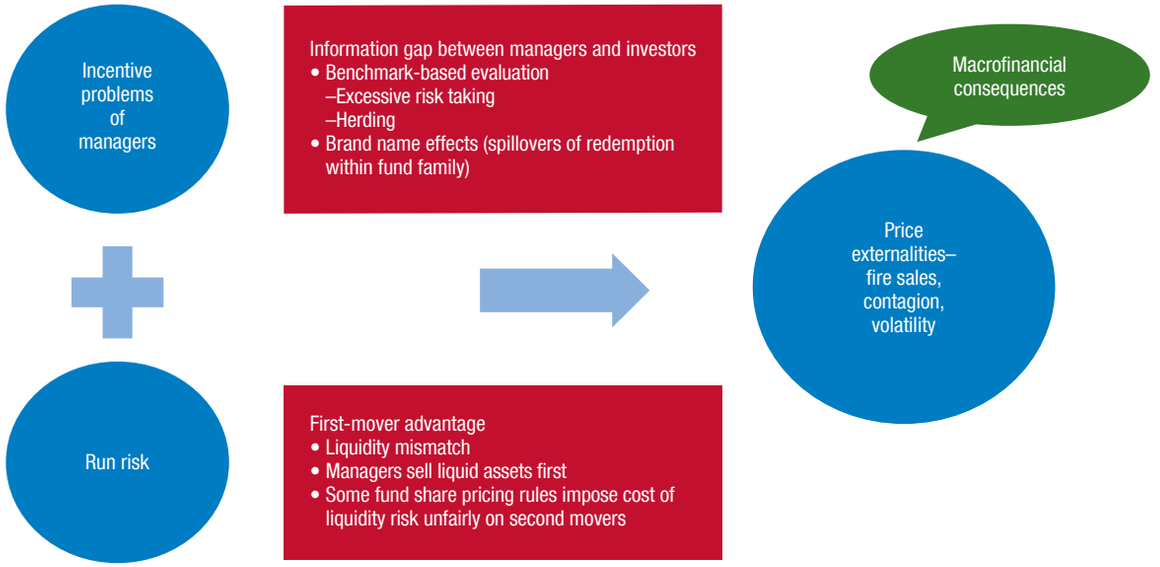
- The delegation of investment decisions introduces incentive problems between end investors and portfolio managers that can induce destabilizing behavior and amplify shocks. Investors delegate day-to-day portfolio management to portfolio managers. Investors cannot directly observe managers' daily actions or their skills, and therefore provide incentives to managers to act in investors' interests (Rajan 2005).[9] A common (and imperfect) way of establishing incentives is to evaluate funds relative to their peers and relative to benchmarks. This form of evaluation, in turn, can lead to a variety of trading dynamics with potentially systemic implications, such as herding or excessive risk taking (Box 3.1).[10,11]

[9]Legally, asset managers have a duty to act as fiduciaries on behalf of their clients.

[10]Similarly, the same type of informational issues can make it difficult for investors to distinguish between problems at the fund level versus problems at the AMC level, possibly leading to "brand name" effects, in which operational and reputational concerns about one fund spill over to others in the same fund family.

[11]Separate issues arise from passive, index-linked investing. Increasing investment of this form has been argued to distort asset

Figure 3.4. Unleveraged Open-End Funds and Systemic Risk



Source: IMF staff.

- Easy redemption options can create run risks due to a first-mover advantage.[12] Investors can have an incentive to exit faster than the others even without constant net asset value (NAV) or guaranteed returns if the liquidation value of fund shares declines as investors wait longer to exit. This decline in value could happen for various reasons. First, asset managers may use cash buffers and sell relatively more liquid assets first in the face of large redemptions. Second, certain funds have fund share pricing rules that pass the costs of selling assets—possibly at fire-sale prices—on to the remaining investors (Box 3.2). Such effects are intensified when funds are investing in relatively less liquid assets, and thereby create large mismatches between the market liquidity of assets and liquidity offered to end investors (October 2014 *Global Financial Stability Report*).[13]

A large proportion of funds issue easily redeemable shares, and liquidity mismatches have been rising (Figures 3.5 and 3.6). Open-end funds are exposed to redemption risk because investors have the ability to redeem their shares (usually on a daily basis) while funds have increasingly been investing in relatively illiquid securities such as high-yield corporate bonds and emerging market assets.

Large-scale sales by funds may exert significant downward asset price pressures, which could affect the entire market and trigger adverse feedback loops. The effects on asset prices could have broader macrofinancial consequences, affecting the balance sheets of other actors in financial markets; reducing collateral values; and reducing credit financing for banks, firms, and sovereigns. The effects could also be spread unevenly across jurisdictions. For instance, the main impact of trades by funds domiciled in advanced economies could be felt in emerging markets (see April 2014 *Global Financial Stability Report* for details).

Although these potential risks and propagation channels are recognized as theoretical possibilities, there is disagreement about their importance in practice. Advanced economies have experienced few cases in which asset management activities outside of hedge funds and money market funds triggered or amplified

prices and risk-return tradeoffs (Wurgler 2010 and Box 3.1). This chapter does not explore these issues.

[12]The incentive to redeem quickly is often referred to as "strategic complementarity," and is similar to the mechanism behind bank runs (as in Diamond and Dybvig [1983]). More generally, problems related to the delegation of investment decisions or first-mover advantage are also present in other forms of financial intermediation, albeit to different degrees. For instance, pension funds and insurance companies face much lower redemption risks.

[13]A related issue concerns the pricing of infrequently traded securities. The October 2014 *Global Financial Stability Report* discusses some of the issues related to the so-called matrix pricing.

Box 3.1. Possible Incentive Problems Created by Delegated Management

The delegation of investment decisions introduces incentive problems between end investors and fund managers, which can induce destabilizing behavior and amplify shocks. As discussed in the primer on the asset management industry (Annex 3.1), end investors delegate day-to-day control of portfolios to managers. Investors cannot directly observe managers' abilities, nor do they see every single trade and portfolio position. Investors, therefore, provide incentives to asset managers to act in investors' interests (Rajan 2005). A common way of providing incentives is to evaluate asset managers relative to their peers and to benchmarks. This evaluation can take direct or indirect forms: (1) managers' compensation can be linked to relative performance (Ma, Tang, and Gomez 2013) or (2) investors inject money into funds that perform well relative to their benchmarks. The effect of the latter is similar to the effect of the former if compensation increases with assets under management (AUM). These incentive problems, in turn, can lead to a variety of dynamics with potentially systemic implications (Stracca 2006). More specifically, they can lead to the following:

- *Excessive risk taking*—If a fund's AUM grow more with good performance than shrink with poor performance, incentives are created to incur more risk when the fund is falling behind (Chevalier and Ellison 1997; Ferreira and others 2012; see the example in Table 3.1.1). Similar incentives exist in a "tournament" setting, in which funds are evaluated based on their interim performance (say, in the middle of the year) compared with peers (Basak, Pavlova, and Shapiro 2008).[1]
- *Contagion*—By contrast, if fund managers become more risk averse in response to past losses, and if they are evaluated against their peers or benchmarks, they may be induced to retrench to the benchmark in response to losses. This behavior, in turn, can induce the transmission of shocks across assets and result in momentum trading (Broner, Gelos, and Reinhart 2006). See Calvo and Mendoza (2000), Chakravorti and Lall (2003), and Ilyina (2006) for other types of models linking benchmark-based compensation to contagion.
- *Herding, return chasing, and incentives to run*—Evaluation relative to average performance tends to induce risk-averse portfolio managers to mimic the behavior of peers (Scharfstein and Stein 1990; Arora and Ou-Yang 2001; Maug and Naik 2011). Incentives to herd are reinforced because end investors can exit funds quickly, and mutual fund managers cannot afford to wait until their peers' private information is revealed and incorporated fully in asset prices (Froot, O'Connell, and Seasholes 2001). Vayanos (2004) shows that when fund managers lose AUM because of poor performance, "flights to quality" may occur. Feroli and others (2014) construct a model in which performance evaluation relative to benchmarks creates incentives for fund managers to join sell-offs during downturns and chase yield during upturns. Buffa, Vayanos, and Woolley (2014) discuss theoretically how such benchmark-centric assessments can contribute to the buildup of bubbles.
- *Churning and noise trading*—Delegated portfolio management may induce managers to churn (engage

Table 3.1.1. An Illustrative Example of Asset Managers' Incentives for Risk Taking
Because investors reward winners more than they punish poor performers, it pays to take risks.

Options	Likelihood (percent)	Outcome: Change in Net Asset Value	Net Inflows to Fund (millions of U.S. dollars)	Additional Fee Income (1 percent of assets under management, in millions of U.S. dollars)
Benchmark Portfolio	100	Same as benchmark	0	0
Gamble	50	10% in excess of benchmark	100	1
	50	10% below benchmark	–20	–0.2
	Expected outcome	Same as benchmark	40	0.4

[1]This is also known as the "risk-shifting" problem. More generally, risk shifting arises when earnings for managers are convex based on their compensation. Limited liability also contributes to the convexity of manager earnings. See Ross (2004) for a qualification of the payoff convexity argument. See also Massa and Patgiri (2009).

Box 3.1 *(continued)*

in noise trading) to signal their talent and superior knowledge, given that it is difficult to identify talent and effort (Allen and Gorton 1993; Dow and Gorton 1997; Dasgupta and Prat 2006).

- *Market depth and volatility*—Performance evaluation relative to a benchmark may lead to higher price volatility of securities that are included in the benchmark. Since information acquisition may be hindered by these relative-performance-based contracts, the depth of the market may be reduced (Igan and Pinheiro 2012). Basak and Pavlova (2014) develop a general-equilibrium asset price model that incorporates incentives for institutional investors to do well relative to their index. The induced investment patterns create excess correlations among stocks belonging to an index. It also increases the volatility of index stocks and of the overall market.

Box 3.2. Fund Share Pricing Rules and First-Mover Advantage

Certain forms of fund share pricing can give rise to a first-mover advantage for investors to run. The key factor is how investment losses and trading costs are distributed between buy-and-hold and redeeming fund shareholders. If these are borne by the fund and therefore by the buy-and-hold shareholders, investors can recover more cash by redeeming early.

Inflexible net asset value (NAV) pricing can generate a first-mover advantage for an open-end mutual fund (Table 3.2.1). In the United States, funds issuing redeemable securities are required to sell, redeem, or repurchase such securities based on the NAV of the security "next computed" after receipt of the order. Transaction costs—trading fees, market

Table 3.2.1. Comparison of Fund Pricing Rules
(Millions of U.S. dollars)

Transactions	UCITS Swing Pricing (Full)	UCITS-AIF Dual Pricing	U.S. Open-End Mutual Fund (1940 Act)
Beginning NAV	100	100	100
Net Flows	–15	–15	–15
Purchases	+5	+5	+5
Redemptions	–20	–20	–20
Total Costs of Selling Assets (0.1 percent, including bid-ask spread)	0.015	0.015	0.015
Transaction Costs Incurred by Investors Purchasing Fund Shares	–0.005[1]	0	0
Transaction Costs Incurred by Investors Redeeming Fund Shares	0.020	0.015	0
Transaction Costs Incurred by Fund and Remaining Investors	0	0	0.015[2]
Ending NAV	85.000	85.000	84.985
Memo	Estimated transaction costs borne by trading investors		Actual transaction costs borne by fund

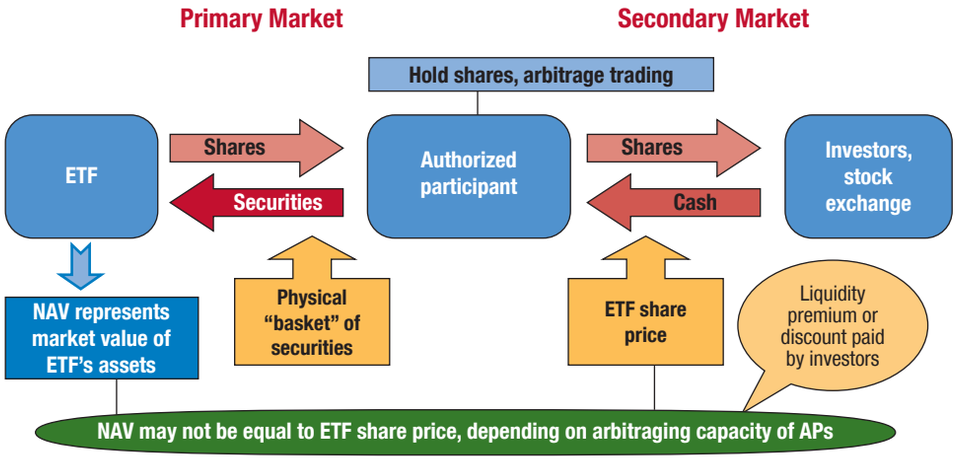
Source: BlackRock (2014b).
Note: AIF = Alternative Investment Fund (European directive governing products including hedge funds and private equity funds); NAV = net asset value (mutual fund share price, per share); UCITS= Undertaking of Collective Investment in Transferable Securities (European Union directive governing publicly offered investment funds). In the United States, investment companies (as defined) are regulated primarily under the U.S. Investment Company Act of 1940.
[1]Because fund NAV has swung to the bid price because of net redemptions, purchasing investors benefit to the extent that they purchase units that are cheaper than preswung NAV. This benefit is offset by the costs paid by redeeming clients.
[2]In certain circumstances, portfolio managers may choose to use cash buffers or borrow funds (or both) to meet redemptions without incurring transaction costs.

Box 3.2 *(continued)*

impact, and spread costs—are borne by the funds. This reduces a fund's NAV, possibly by a substantial amount if market liquidity dries up. The European framework, in contrast, allows for pricing rules such as swing- or dual-pricing rules, as described in Table 3.2.1, that adequately impose transaction costs on redeeming shareholders instead of the fund. This helps reduce remaining shareholders' incentive to run.

The share pricing practice of exchange-traded funds (ETFs) is different from that of open-end mutual funds. As shown in Figure 3.2.1 and Annex 3.1, ETFs do not directly transact with end investors. "Authorized participants"—typically major broker-dealers—trade in between. Only authorized participants trade with ETFs in the primary market, and trades are usually settled in kind. Intraday liquidity to end investors is offered in the secondary market by authorized participants.[1] The key difference between ETFs and mutual funds in the context of first-mover advantage is that ETFs are not required to pay cash back to investors at NAV.[2] Authorized participants trade ETF shares with clients or on stock exchanges at the ETF share price determined in the secondary market. Therefore, depending on market conditions, an ETF's share price could be higher or lower than the ETF's indicative NAV.

Figure 3.2.1. Structure of Exchange-Traded Funds



Source: IMF staff.
Note: AP = authorized participant; ETF = exchange-traded fund; NAV = net asset value.

[1]Although there is a widespread perception that ETFs face higher redemption risks because they offer intraday liquidity to shareholders, intraday liquidity (offered in the secondary market) is not the same as intraday redemption (offered in the primary market). Primary market activities, which result in fund flows, are much less frequent than secondary market trading (ICI 2014c; BlackRock 2014a).

[2]In the United States, ETFs operate with the Securities and Exchange Commission's special exemption from the 1940 Act requirement that open-end funds repay redeeming shareholders at the next NAV calculated after an order is submitted (ICI 2014b).

Box 3.2 *(continued)*

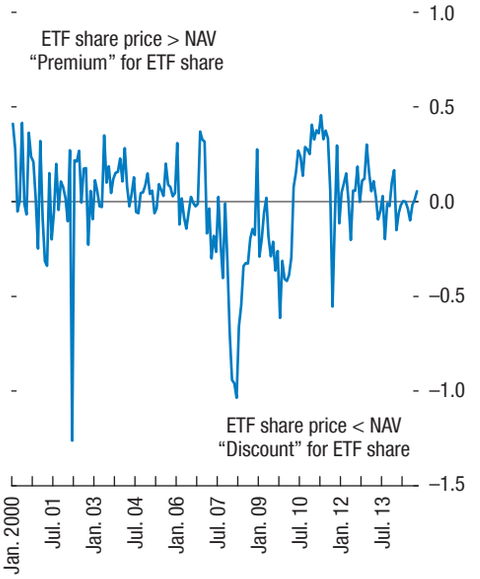
Redeeming shareholders need to pay for the cost of market liquidity risk by accepting an ETF share price below NAV if market liquidity dries up. Authorized participants are usually arbitrageurs, and if they see a major gap between NAV and ETF share prices, they trade in the direction to close the gap. If investors find it easier to sell ETF shares relative to the underlying assets, this will tend to result in a discount to NAV. The discount can be accentuated when funding conditions reduce authorized participants' arbitrage capacity (Figure 3.2.2). The cost of "fire sales" of ETF shares is borne by the trading shareholders, not by the ETF or buy-and-hold shareholders, reducing buy-and-hold shareholders' incentive to run.

Economically, these flexible fund share pricing rules are similar to countercyclical redemption and purchase fees that reflect market liquidity cost and are added to NAV. If a U.S. 1940 Act fund imposes purchase and redemption fees that are retained by the fund[3] and reflect the bid-ask spreads for transactions (or ETF NAV and share price gap), the outcome would be similar to that of funds with flexible share pricing rules. At the same time, such fees also help ensure equality between buy-and-hold investors and trading investors.

Figure 3.2.2. Difference between NAV and ETF Share Price

(Percent of NAV, all countries, equity funds)

The ETF share can be traded in the secondary market at a discount to NAV when markets are under generalized stress.



Sources: Bloomberg, L.P.; and IMF staff calculations.
Note: ETF = exchange-traded fund; NAV = net asset value.

[3]Current U.S. rules do allow for the introduction of fees that are added to funds' NAV, which can then be distributed to remaining shareholders.

systemic distress.[14] The realization of brand risk and redemptions from PIMCO funds in September 2014 did not result in major disruptive market movements because, overall, bond funds continued to receive net inflows. However, the academic literature has documented contagion and amplification effects for some markets, in particular emerging markets.[15] Moreover, recent structural shifts in many markets following the global financial crisis require a fresh review of the evidence.

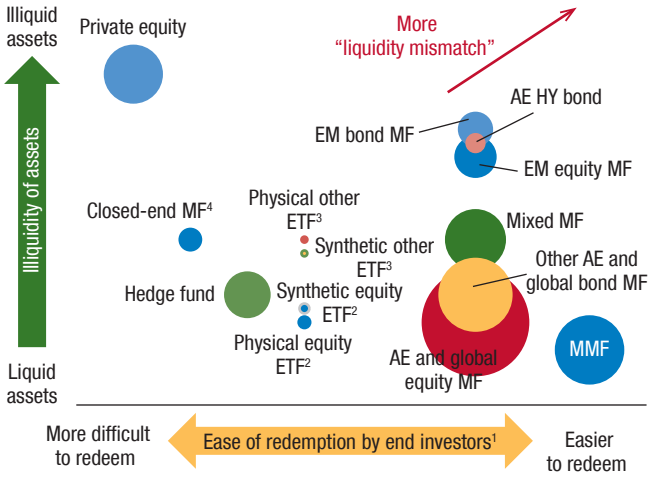
Against this backdrop, this chapter empirically explores the precise channels through which mutual funds and ETFs can affect financial stability. The aim

[14]There have been some cases of non–money market mutual fund distress in emerging markets. For example, in 2001, a fund managed by Unit Trust of India, which was outside the ambit of the Securities and Exchange Board's jurisdiction, became unable to meet its obligations due to the absence of timely corrective action to bring the sale/repurchase price of the units in line with the fund's net asset value. With a risk of a run on the Unit Trust of India and possible adverse financial market impact, India's government came out with a rescue package. The total bail-out amounted to US$76 million.

[15]In addition to the literature on emerging markets discussed in the April 2014 *Global Financial Stability Report*, various studies examine the role of funds in transmitting shocks across markets in advanced economies. Using U.S. data during the global financial crisis, Hau and Lai (2010) find that mutual funds helped transmit shocks from bank equities to nonfinancial firms' equities, and Manconi, Massa, and Yasuda (2012) find that mutual funds that incurred losses from securitized debt sold off corporate bonds, which induced a price impact on bonds held by these funds.

Figure 3.5. Liquidity Mismatches
(Size of bubbles represents relative global assets under management as of end-2013)

The mismatch between the redemption risk to funds and market liquidity of funds' assets is most notable among bond mutual funds—especially corporate and emerging market debt funds, though these are relatively smaller segments.



Sources: BarclayHedge; Deutsche Bank; ETFGI; European Fund and Asset Management Association; Lipper; Preqin; and IMF staff estimates.
Note: The liquidity ranking of assets is based on IMF staff's judgment. AE = advanced economy; EM = emerging market; ETF = exchange-traded fund; HY = high yield; MF = mutual fund; MMF = money market fund.
[1]For ETFs, the ease-of-redemption measure ranks lower than that for open-end MFs (all MFs in the figure excluding closed-end MFs) because end investors do not directly redeem shares from funds (see Annex 3.1 and Box 3.2).
[2]Generally, equity derivatives markets are less liquid than cash equity markets.
[3]For bonds, especially corporate bonds, derivatives markets can offer better market liquidity than the cash bond market. For some firms, the notional principal for their credit default swaps is larger than their outstanding debt.
[4]Closed-end mutual funds tend to invest in relatively less liquid assets than open-end mutual funds (Chordia 1996; Deli and Varma 2002). Some funds may repurchase shares.

is not to provide a final verdict on the overall systemic importance of the potential risks, or draw definite conclusions about whether certain AMCs and their funds should be designated as SIFIs. Rather, the chapter carries out a quantitative analysis of a number of key risk transmission and amplification channels, testing some of the underlying hypotheses, and updating and complementing the existing literature. Given the current absence of a broad-based empirical assessment of the issues, this chapter fills an important gap. In particular, whereas most existing studies cover equity markets, the analysis here also covers bond markets. The chapter does not discuss all sources of risk. In particular, operational risks, risks related to hidden leverage and securities lending, and issues related to resolution are only touched upon (FSOC 2014).[16]

Financial Stability Risks of the Mutual Fund Industry: Empirical Analysis

This section examines various aspects of potential financial stability risks using a wide range of macro- and micro-level data. Three main questions are explored. First, does fund investment affect asset price dynamics? Second, what determines fund flows and how do funds manage liquidity? And third, what is the degree of herding and interconnectedness, and what is the relationship between a fund's contribution to systemic risk and its size?[17]

Mutual Fund Investment and Asset Price Dynamics

Aggregate mutual fund flows and asset prices

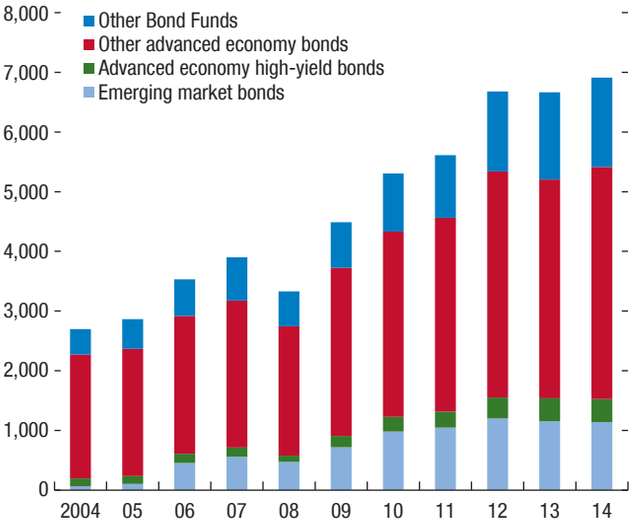
Do fund flows affect asset price dynamics in the United States and in emerging markets? For mutual funds to have a destabilizing effect, fund trades must first, at least in the aggregate, have an impact on prices. The literature suggests the existence of price pressures related to mutual fund flows.[18] The analysis here updates and complements such findings, analyzing weekly net inflows to U.S. mutual funds investing in U.S. equities and various types of U.S. bonds, and their relationship to the respective market index returns. It also investigates mutual fund investment flows into bonds and equities in a number of emerging markets (see Annex 3.2 for details). The analysis goes

[16]Furthermore, the analysis in the chapter does not cover separate accounts held at funds.

[17]The main data sources for mutual funds are Lipper (a global mutual fund database with information at the fund level); the Center for Research in Security Prices (CRSP) U.S. mutual fund database (with security-by-security asset holdings information and details of fee structures); EPFR Global; and Lipper's eMaxx, which shows global mutual fund ownership of bonds at the security level.

[18]Studies include Warther (1995); Edelen (1999); Edelen and Warner (2001); Cao, Chang, and Wang (2008); and Ben-Raphael, Kande, and Wohl (2011). The main conclusion from these studies is that aggregate mutual fund flows affect contemporaneous stock returns. Coval and Stafford (2007) show that sudden increases or decreases in net flows to funds result in price pressure effects even in the extremely liquid U.S. equity market. Manconi, Massa, and Yasuda (2012) document a price impact on corporate bonds following sell-offs by funds. Similarly, Jotikasthira, Lundblad, and Ramadorai (2012) document that investor flows domiciled in developed markets induced fire sales in emerging markets, with a significant price impact. Feroli and others (2014) analyze several subsegments of bond fund flows, and find evidence for flow-price feedback loops, except for U.S. Treasuries.

Figure 3.6. Growth in Bond Funds by Investment Focus
(Assets under management of bond funds worldwide; billions of U.S. dollars)



Sources: Lipper; and IMF staff calculations.

beyond most of the literature by examining the price impact of the "surprise" component of fund flows, following Acharya, Anshuman, and Kumar (2014).[19,20]

The evidence is consistent with mutual fund flows affecting asset returns in smaller, less liquid markets (Table 3.2). Surprise outflows are associated with lower same-week asset returns in emerging markets, and to a lesser extent in U.S. high-yield bond and municipal bond markets. The annualized price impact is not negligible: bond returns rise by about 5 percentage points when aggregate fund inflows are higher than the top 25th percentile, and fall by a similar magnitude for outflows exceeding the top 25th percentile across bond categories. In emerging markets, and also in the U.S. municipal bond market, the negative price effects from sell-offs tend to be larger than the positive price effects from purchases. The price impact of surprise flows is significantly larger when global risk aversion (as measured by the Chicago Board Options Exchange Market Volatility Index, or VIX) is high. More-

[19]As will be shown later in this chapter, mutual fund flows partly respond to past fund returns and are therefore partially predictable. Surprises are measured by the residuals of a standard vector autoregression model for flows and returns; see Annex 3.2.

[20]In contrast to much of the literature, this analysis uses weekly, not monthly, data, which allows for better identification of the effects. Nevertheless, inference remains difficult at this frequency.

Table 3.2. Mutual Fund Flows and Asset Returns

	Emerging Markets		United States			
	Equity	Bond	Equity	All Bond	High-Yield Bond	Municipal Bond
Estimation Periods	2004–14	2004–14	2007–14	2007–14	2007–14	2007–14
Single Equation Model with Excess Asset Return as Dependent Variable						
Surprise flows have significant impact on returns	Yes	Yes	Yes in 2012–14	Yes in 2008–10	Yes*	Yes
Asymmetry: Impact of surprise inflows is different from impact of surprise outflows	Outflows have larger impact than inflows	Outflows have larger impact than inflows	Limited**	Inflows have larger impact than outflows	No	Outflows have larger impact than inflows
VIX sensitivity: Surprise flows have higher impact on returns when the VIX is high	Yes	Yes	Limited**	Limited**	Yes	Yes
Vector Autoregression with Unadjusted Flows and Returns						
Flows help predict returns	No	Yes	No	Yes***	No	Yes***

Sources: Bank of America Merrill Lynch; Morgan Stanley; Bloomberg, L.P.; EPFR Global; ICI; and IMF staff estimates.

Note: VIX = Chicago Board Options Exchange Market Volatility Index. Surprise flows are residuals from a vector autoregression model, VAR, with two endogenous variables (mutual fund flows into each asset class and representative benchmark asset returns for the respective market over the one-month Eurodollar deposit rate) and the VIX (contemporaneous and lagged) as an exogenous variable. Mutual fund flows to emerging markets are investment flows into each country from all mutual funds from various jurisdictions covered by EPFR Global. U.S. fund flows data are investors' flows into mutual funds with a stated investment focus, covering funds domiciled in the United States. U.S. data are from Investment Company Institute, except for U.S. high-yield bond funds, which come from EPFR Global. Explanatory variables in the base single equation model include contemporaneous and lagged surprise flow, lagged excess return, the VIX, and the volatility of excess return (estimated with a generalized autoregressive conditional heteroskedasticity, GARCH, model). The model is estimated for the whole indicated period as well as rolling three-year periods in between. The results in the bottom line are based on generalized impulse responses.

*For the entire sample period, the results are not significant. However, three-year subperiod estimates show that the coefficient on contemporary surprise flows is always statistically significant and positive, but declines steadily over time. Limited ** indicates significance between the 5 percent and 10 percent significance levels. ***Indicates not robust to all specifications.

over, bond markets show evidence of nonlinearities, with unusually large surprise inflows or outflows associated with a disproportionate impact on bond returns. There is no evidence, however, for an increase in the price impact over time—if anything, the evidence across markets indicates a decline in the effect.[21]

The price impact pattern provides support for the existence of a first-mover advantage only in less liquid markets. Flows helping to predict price movements would be consistent with the presence of incentives to run.[22] Such predictive power of flows is more likely to be present in less liquid markets. In line with this notion, the evidence indicates that flows have an impact on future returns of emerging market bonds, and to a lesser extent, in U.S. bond and municipal bond markets. For the latter two markets, however, the results are not robust across econometric specifications. Possibly, the considered aggregate bond categories may be too broad and too liquid to unambiguously pick up the effect.[23]

Effect of mutual fund holdings and their concentration on bond yields

Does concentration of holdings among mutual funds matter during periods of stress? Some mutual funds have a large footprint in specific market segments, raising concerns that decisions by a few portfolio managers may have a large price impact in those markets. Since the global financial crisis, mutual fund bond holdings and their concentration have risen somewhat (Figure 3.7, panels 1 and 2).[24] The evidence in the literature suggests that concentration matters for stock price dynamics, in particular during periods of volatility.[25] This section investigates this issue further using security-level bond ownership data, assessing whether mutual fund holdings and their concentration were correlated with the degree of bond yield changes around the global financial crisis and the taper shock in 2013, after controlling for bond-specific characteristics (see Annex 3.2 for details). The analysis goes beyond the literature to date by covering different asset markets, including corporate bonds for advanced economies, and corporate and public sector bonds for emerging market economies.

The findings suggest that larger mutual fund holdings and greater ownership concentration adversely affect bond spreads in periods of stress (Figure 3.7, panels 3 and 4). During the period of sharp price adjustments around the global financial crisis in 2008, bonds with larger fund ownership and those with a higher concentration of ownership experienced higher increases in credit spreads. Possibly, this is related to incentives to run created by funds. In the face of price drops of assets held by their fund, end investors may be induced to redeem quickly, for fear that they could be disadvantaged if they exit late. The effect was most pronounced among those securities with the highest initial spreads. This may suggest that funds either try to actively alter their holdings in a crisis by reducing exposures to riskier bonds, or are forced to sell riskier securities to meet investor redemptions. Investor concentration made bonds from emerging market and developing economies more vulnerable to the 2013 taper episode, but this was not the case for bonds from advanced economies.

Behavior of Fund Flows and Fund Liquidity Management

Roles of end investors and asset managers

Mutual fund investments are driven by the decisions of both end investors (fund flows) and asset managers (portfolio rebalancing). A fund's investment in a specific asset can increase either because the fund receives money from end investors that is proportionally allocated to all assets, or because the portfolio manager invests relatively more money into the asset (portfolio rebalancing). To ascertain the relative importance of each factor, the analysis compares the variances of (1) changes in the return-adjusted weights of each security in a fund's portfolio and (2) fund flows (see Annex 3.2). For U.S.-domiciled funds, the results indicate that about 70 percent of

[21]The evidence on contemporaneous price effects does not conclusively prove that fund flows drive returns. For example, fund flows and returns could both be driven by news. Still, this would leave the question open of why mutual fund flows behave distinctively (since not everybody can trade in the same direction in response to news).

[22]The argument (as laid out in Stein [2014]) is that if outflows are first met with cash and the sale of more liquid assets, while less liquid assets are sold gradually, predictable downward pressure would be created on the prices of these less liquid assets. This, in turn, would create an incentive for end investors to pull out quickly if others are withdrawing.

[23]See also Collins and Plantier (2014). Moreover, the effects are more likely to be present at times of stress, and are therefore not easily picked up in an estimation spanning a long period.

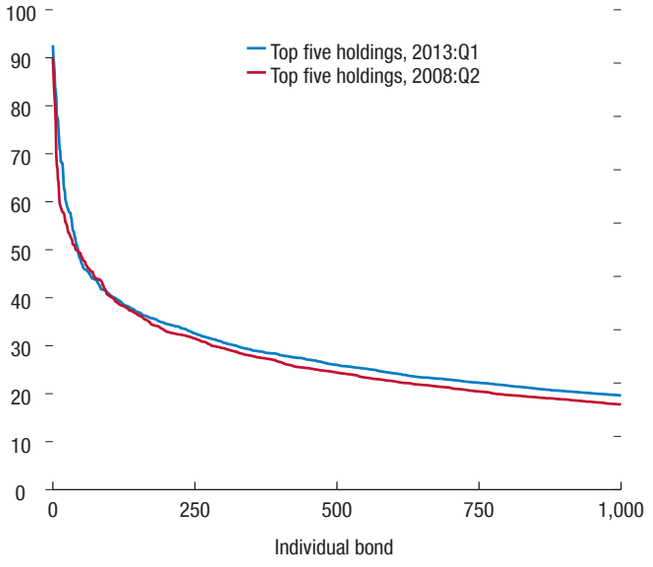
[24]Concentration is measured by identifying, for each individual bond, the largest five investors among mutual funds. Alternative measures (top 10 investor holdings and Herfindahl index) yield similar results.

[25]Greenwood and Thesmar (2011) report that fragility, measured by the concentration of mutual fund ownership of large U.S. stocks and the correlation of trading among investors, strongly predicts price volatility over 1990–2007. For Spanish stocks, Desender (2012) finds that ownership concentration is valued positively (negatively) by the stock market during down (up) market periods.

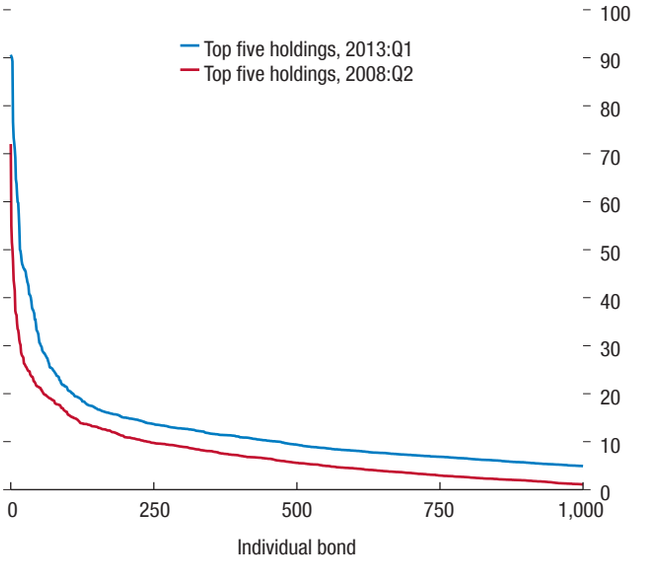
Figure 3.7. Bond Ownership Concentration and Its Effects on Credit Spreads

Mutual fund concentration in bond markets has increased somewhat since the global financial crisis.
(Share of individual bonds held by the five largest mutual funds in 2008 and 2013, percentage points)

1. Concentration of Mutual Fund Bond Ownership: U.S. Bonds

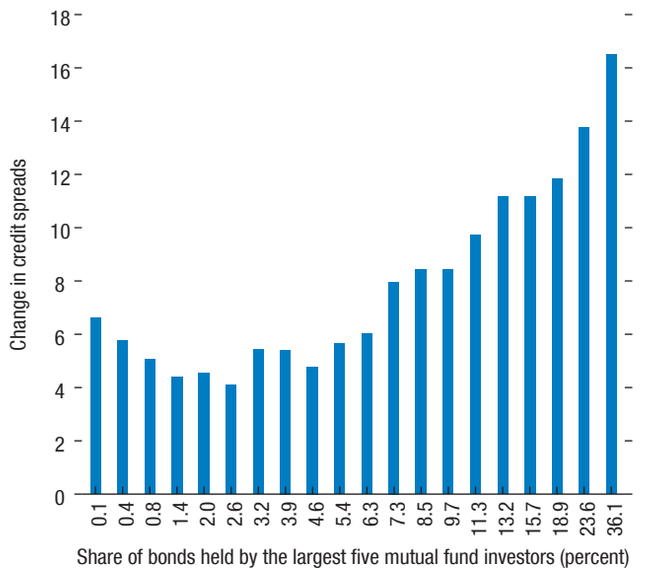


2. Concentration of Mutual Fund Bond Ownership: Emerging Market and Developing Economy Bonds

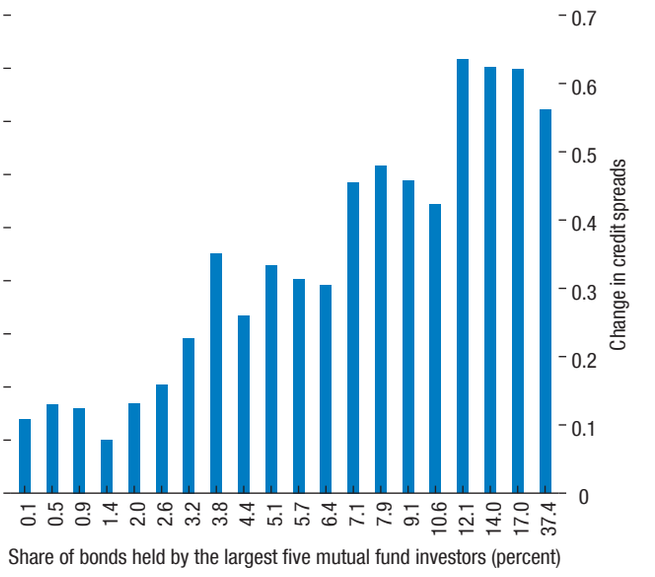


Bonds with higher mutual fund holding concentration were more adversely affected during stress periods in 2008 and 2013.
(Increase in credit spreads by share of bonds held by the five largest mutual funds, percentage points)

3. Corporate Bonds Issued by U.S. Issuers, 2008:Q2 and 2008:Q4



4. Bonds Issued by Emerging Market and Developing Economies, 2013:Q1 and 2013:Q2

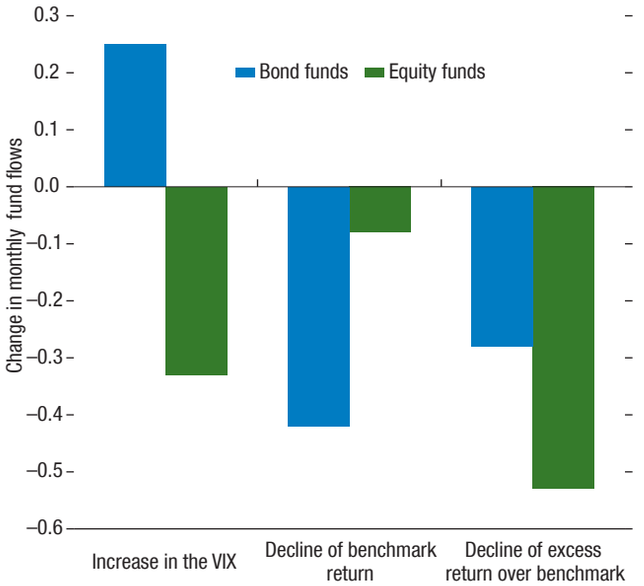


Sources: eMaxx; and IMF staff calculations.
Note: In all panels, holdings by the five largest mutual funds are identified for each individual bond. Bonds are sorted in different buckets on the horizontal axis according to the share of the bond held by the five largest mutual funds. The vertical axes in panels 3 and 4 show the average change in credit spreads (bond yields over benchmark government bond yields of the same currency and similar maturity) for bonds in each bucket, between 2008:Q2 and 2008:Q4, and 2013:Q1 and 2013:Q2, respectively.

Figure 3.8. Drivers of Fund Flows from End Investors
(Monthly fund flows, percent of total net assets)

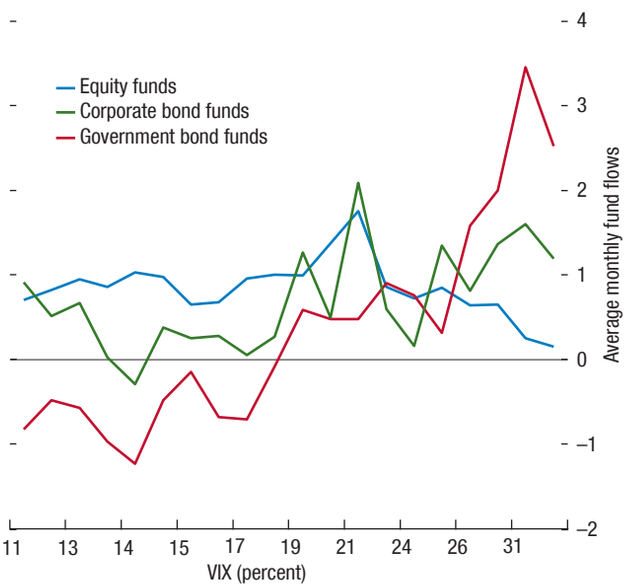
Fund flows are strongly influenced by asset class performance, a fund's own performance, and the VIX.

1. Sensitivity of Fund Flows to Fund Performance and Market Conditions (The effect of a one standard deviation shock to each driver)



Periods with high VIX see a flight to quality from equity to bond funds, especially to government bond funds.

2. Fund Flows and the VIX



Sources: Bloomberg, L.P.; and IMF staff estimates. Additional data: Calculated based on data from the survivor-bias-free U.S. mutual fund database ©2014 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business.
Note: VIX = Chicago Board Options Exchange Market Volatility Index. Estimates in panel 1 are based on a regression of fund flows on the VIX, benchmark performance (lagged), excess performance over benchmark (lagged), age, and size. The model is estimated using share-class-level data covering 1998–2014. For more details on estimations and data, see Annex 3.2. Panel 2 splits observations into 20 quantiles based on the VIX. For each of these quantiles, the simple average for the VIX and fund flows is reported by type of fund.

the variance of funds' flows into assets is attributable to managers' decisions, with the remaining 30 percent attributable to end investors. This decomposition does not, however, take into account that, as discussed earlier, managers' behavior is to a significant extent indirectly driven by the incentives provided by end investors, including through the pattern of inflows.

Determinants of fund flows

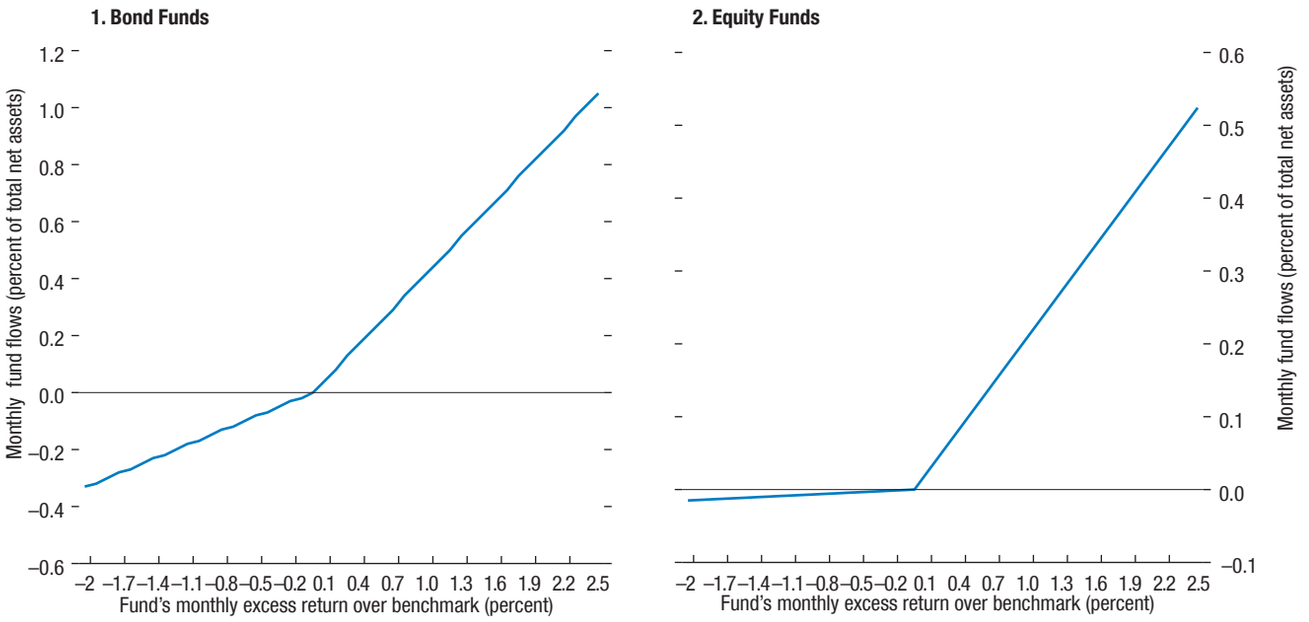
Given the importance of fund inflows for mutual fund investment and induced price effects, this section investigates the determinants of net fund injections by end investors. The analysis uses monthly net inflows for U.S. mutual funds and ETFs at the funds' share-class level for open-end bond and equity funds, covering the period 1998–2014 (Annex 3.2).[26] Explanatory variables include fund performance (benchmark return and fund return in excess of the benchmark return), the VIX, fund characteristics (size, age, clientele) and structures (purchase and redemption fees, and dummies for index funds and for ETFs), and the liquidity of the underlying asset class.

End investors' flows to funds, especially those from retail investors, are procyclical and display a "flight to quality" during times of stress (Figure 3.8):

- Fund flows increase after good market performance of the respective asset class. This indicates that investors pursue momentum strategies, increasing their allocation to asset classes that have performed well in the past, and selling past losers.
- End investors engage in a flight to quality during episodes of stress. As uncertainty (measured by the

[26]A mutual fund can issue multiple classes of shares that only differ in the structure of various types of fees (FINRA 2011). The sample includes U.S.-domiciled open-end mutual funds and ETFs, irrespective of their investment focus. For instance, U.S. funds investing in emerging market debt are included. The focus is on the United States because of data availability on fees, as a result of more comprehensive disclosure requirements.

Figure 3.9. Convexity of Fund Flow–Performance Relationship



Sources: Bloomberg, L.P.; and IMF staff estimates. Additional data: Calculated based on data from the survivor-bias-free U.S. mutual fund database ©2014 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business.
Note: Estimates in the two panels are based on a regression of net inflows on VIX, benchmark performance (lagged), excess performance over benchmark (lagged), and age. The model allows for different slopes for negative and positive values of excess performance over benchmark. The estimation uses share-class-level data covering 1998–2014. For more details, see Annex 3.2.

VIX) rises, end investors shift away from equity funds to bond funds, especially to sovereign bond funds. A closer look at subgroups of bond funds and emerging market assets reveals that investors also flee from corporate and emerging market bonds when the VIX rises.[27]

- Relative performance is a main driver of fund inflows. This behavior by end investors provides incentives for herding, as discussed earlier.
- Investors disproportionately pour money into funds with strong recent performance, creating an incentive for managers of poorly performing funds to increase risks. Funds with excess returns over their benchmark receive disproportionately more inflows (Figure 3.9). In line with the existing evidence based on U.S. equity mutual fund data (Chevalier and Ellison 1997), investors inject money into winning funds to a greater extent than they punish poor performers (implying a convexity in the performance-inflow relationship). Thus, poorly performing fund managers have an incentive to take more risky bets (see Box 3.1 for details). The convexity is weaker for bond funds. Similar to the findings in Ferreira and others (2012), an analysis for non-U.S. funds shows that convex patterns are observed in some but not all economies, with equity funds generally displaying more convexity.

Client types, fees, and to some extent the market liquidity of assets and fund characteristics influence the sensitivity of fund flows to performance (Figure 3.10):

- Institutional investors appear to be less influenced by recent past performance. However, this result is not robust across all subperiods considered. Institutional investors are likely to be more sophisticated than retail investors, and findings in the April 2014 *Global Financial Stability Report* show that flows from institutional investors to emerging market assets are less sensitive to changes in the VIX.[28]

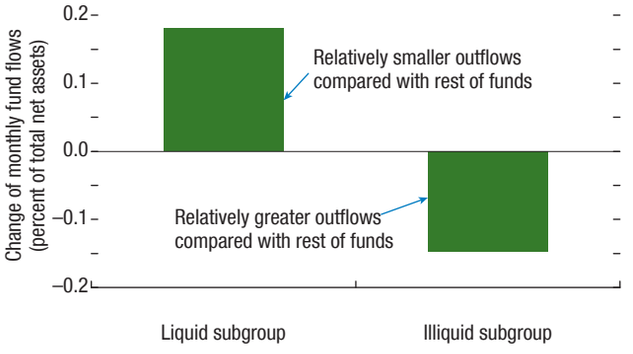
[27]Based on similar analysis for funds (from all jurisdictions) investing in emerging market assets using EPFR Global. This is in line with the findings of the April 2014 *Global Financial Stability Report*.

[28]However, in the presence of more fundamental financial and macroeconomic problems, institutional investors withdraw more aggressively than retail investors. For instance, Schmidt, Timmermann, and Wermers (2013) point out that institutional investors were the first ones to recognize problems with money market funds and instigated a run in 2009. The April 2014 GFSR finds that institutional investors sold off more when emerging market sovereigns were downgraded to below investment grade.

Figure 3.10. Liquidity Risk and Fund Structures

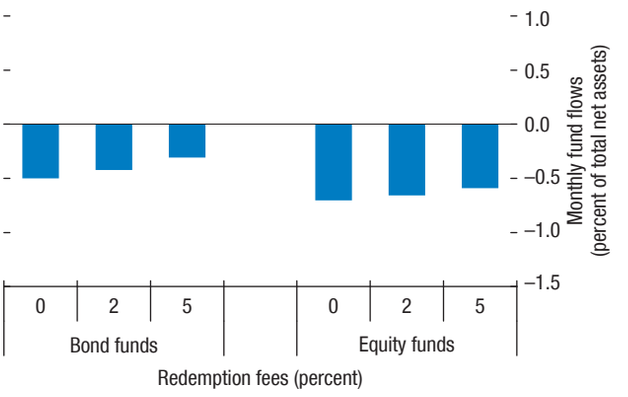
Among equity funds, fund flows of funds investing in liquid stocks are less sensitive to performance.

1. Relative Sensitivity of Equity Fund Flows to Performance (Response of flows into liquid and illiquid funds to a one standard deviation decline in benchmark returns, difference with respect to rest of funds)



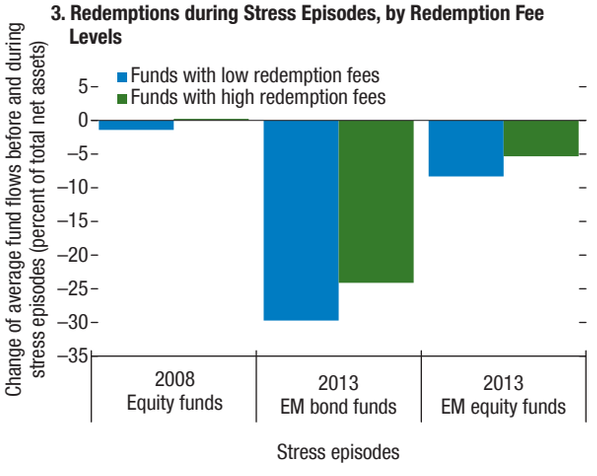
Redemption fees are effective in mitigating outflows.

2. Fund Flows by Redemption Fees (The effect of a one standard deviation decline of returns)



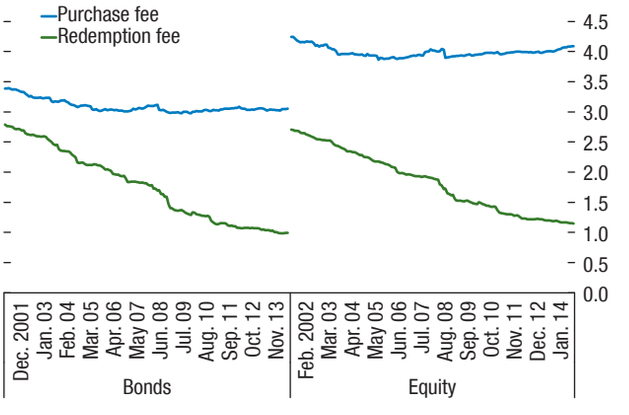
Redemption fees have helped mitigate redemptions during stress episodes, especially for emerging market funds.

3. Redemptions during Stress Episodes, by Redemption Fee Levels



However, mutual fund fees, especially redemption fees, have declined during the past 15 years because of competitive pressures in the industry.

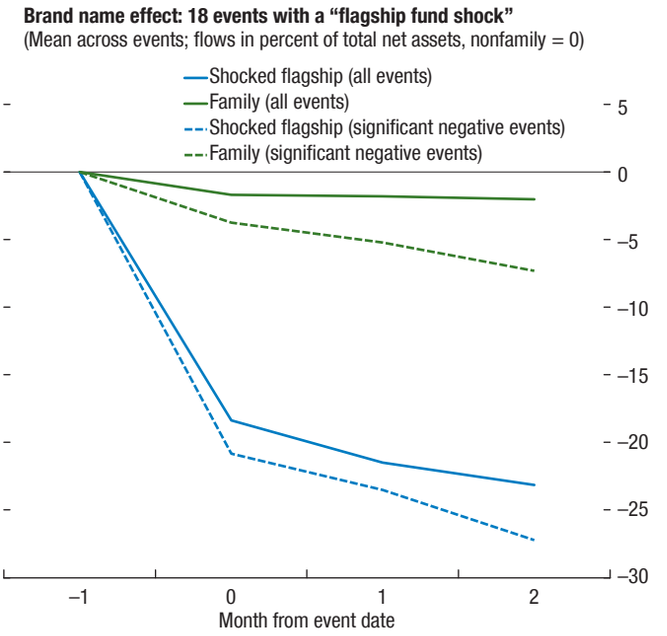
4. Trend of Mutual Fund Fees (Simple average, percent)



Source: IMF staff estimates. Additional data: Calculated based on data from the survivor-bias-free U.S. mutual fund database ©2014 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business.
Note: EM = emerging market; VIX = Chicago Board Options Exchange Market Volatility Index. Fees are maximum reported fees in the prospectus. Redemption fees include narrowly defined redemption fees and contingent deferred sales charges. Estimates in panels 1 and 2 are based on a regression of net inflows on the VIX, benchmark performance (lagged), excess performance over benchmark (lagged), age, size, and the reported fund characteristics (added one at a time) interacted with excess performance over benchmark (lagged). The estimation uses share-class-level data covering 1998–2014. Panel 3 computes the difference between average flows before the crisis period and average flows during the reported stress episodes (September to December 2008 for the global financial crisis, and May to September 2013 for the tapering episode). Fund flows are standardized by the beginning-of-period total net assets. Funds are classified as having low redemption fees if redemption fees are equal to zero. Funds are classified as having high redemption fees if redemption fees are greater than or equal to 3 percent in 2008 and 1 percent in 2013. For more details on estimations and data, see Annex 3.2.

- Fees are generally effective in dampening redemptions following short-term poor performance, though competitive pressures in the industry challenge their use. In particular, redemption fees appear to be effective. However, among bond funds, the effectiveness of fees appears to vary across fund types: the fees dampen redemptions for emerging market bond funds, but not for U.S. government bond or corporate bond funds. Moreover, competitive pressures and transparency requirements in the industry have driven down fees during the past 15 years (Figure 3.10, panel 4), which would make it difficult for individual funds to adopt adequate fees in line with their investment risk without sector-wide coordination or regulation.[29]
- The sensitivity of redemptions to benchmark performance is larger for equity funds investing in less liquid stocks. This result is in line with the findings in Chen, Goldstein, and Jiang (2010) for U.S. equity funds. As discussed by Stein (2014), a higher redemption sensitivity of less liquid funds is consistent with the existence of a first-mover advantage. Although one would expect the evidence to be stronger for bond funds (because of their larger liquidity mismatches; Figure 3.5), that is not the case. One reason could be that bond funds with higher liquidity mismatches manage their liquidity risk more carefully, as discussed in the following section.

Figure 3.11. Brand Name Effects
(Cumulative fund flows from event date in percent of total net assets, mean difference from median comparator funds)



Source: IMF staff estimates. Additional data: Calculated based on data from the survivor-bias-free U.S. mutual fund database ©2014 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business.
Note: "Flagship shocks" for large asset management companies are identified as periods with large outflows from flagship funds (10 percentage points above those of the median of funds with shared investment objectives). Regression analysis for each of those events is used to test whether funds in the affected flagship family receive lower net inflows relative to nonfamily funds. See Annex 3.2 for details.

Brand name effects are present, albeit weak. This analysis examines 18 events in which a "flagship fund" of a large AMC experienced large redemptions (see Annex 3.2 for details). The test is whether funds in the fund family hit by the flagship shock experience larger outflows than similar funds not in the fund family. Out of the 18 events, 10 cases show statistically significant negative brand name effects, 3 cases show statistically positive effects, and the other 5 cases show no significant effects (Figure 3.11).

How do funds manage liquidity risks?

The effects of fund flows on fund investment can be cushioned by liquidity risk management. For instance, if a fund holds sufficient cash buffers when faced with large redemptions, the effect on sales pressures will be dampened. Moreover, funds' share pricing rules and redemption policies can be designed to reduce redemption risks. Existing research (though somewhat old and focused on equity funds) shows that funds investing in illiquid assets tend to take the form of closed-end funds with no redemption risk, charge fees for fund share purchases and redemptions, and hold more cash (Chordia 1996; Deli and Varma 2002). This section looks at how fund managers use these tools to manage liquidity risks by examining their cash holding patterns in relation to flow volatility, current fund flows, and various fund characteristics, including liquidity of assets and client type (institutional or retail). In contrast to previous studies, the analysis here also covers bond funds and uses more recent data.[30]

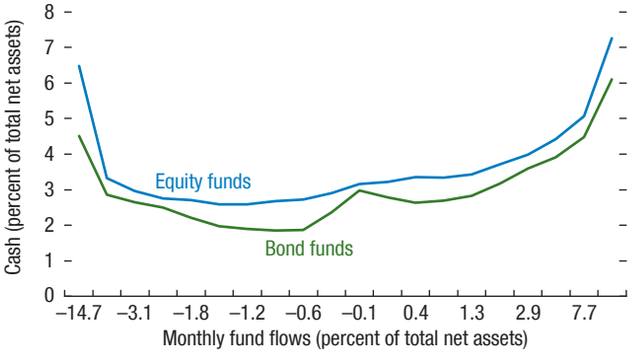
[29]Figure 3.10 shows the maximum charge reported in the fund's prospectus. In practice, funds often offer discounts, reducing effective fees to much lower levels. ICI (2014b) reports that effective purchase fees declined from nearly 4 percent in 1990 to 1 percent in 2013.

[30]Funds can also manage liquidity using derivatives, something not studied here because of a lack of data.

Figure 3.12. Funds' Liquidity Risk Management

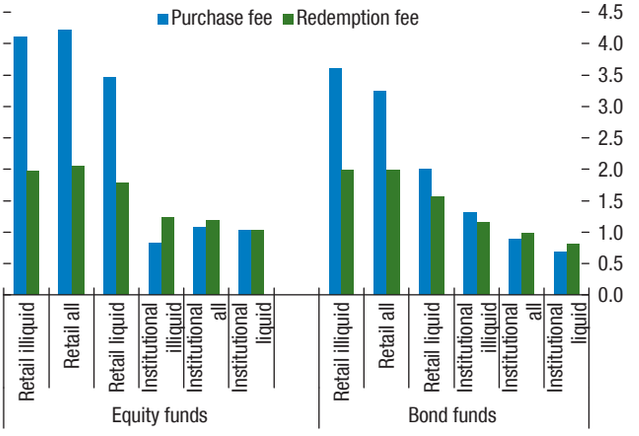
Cash holdings are high for those funds experiencing large inflows or outflows.

1. Cash Holding by Fund Flows
(Using monthly share-class-level data for 1998–2014)



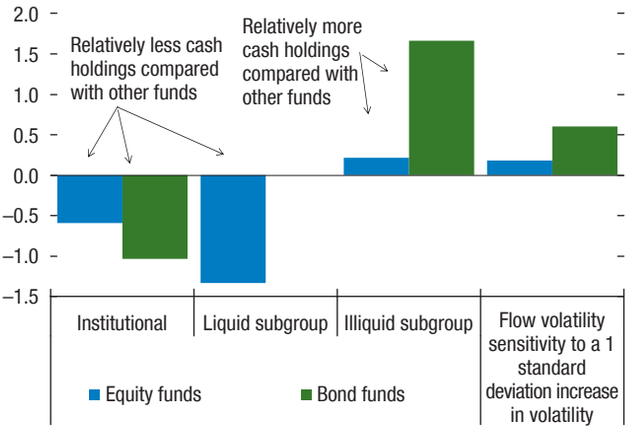
Funds charge higher fees to retail investors and when investing in illiquid assets…

2. Mutual Fund Fees by Investment Focus and Clientele
(Simple average, percent)



…and hold more cash when investing in relatively illiquid assets, facing higher fund flow volatility. They hold less cash when they have predominantly institutional clients.

3. Differences in Cash Holdings across Funds
(Percent of total net assets)



Sources: Calculated based on data from the survivor-bias-free U.S. mutual fund database ©2014 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business; and IMF staff estimates.
Note: Panel 1 is based on monthly data from 1998 to 2014 for each fund share class. It splits observations into 20 quantiles based on net fund flows (in percent of total net assets). For each of these quantiles, the panel shows the mean percentage of cash in funds' portfolios. In panel 2, fees are maximum reported fees in the prospectus. Redemption fees include narrowly defined redemption fees and contingent deferred sales charges. Estimates in panel 3 are based on a regression of cash holdings (in percentage of total portfolio) as a function of net inflow volatility, lagged net inflows, and the reported fund characteristics dummies.

Generally, asset managers choose cash buffers and fee policies to limit liquidity risks, though competitive pressures have been reducing the use of redemption fees (Figure 3.12):

- Asset managers appear to actively manage their liquidity risks with precautionary cash buffers (Figure 3.12). Cash holdings are high for those funds experiencing very large outflows (in line with a precautionary motive) and inflows (presumably because managers take some time to fully invest new money). Estimation results confirm that funds also hold higher cash buffers when they face more volatile flows from investors and when these investors are primarily less stable retail investors. Similarly, cash holdings are higher for funds investing in relatively less liquid assets.
- Funds with higher liquidity risks tend to charge higher fees (Figure 3.12, panel 2). Fees are generally set lower for institutional investors. Funds investing in more illiquid assets tend to set higher fees than those investing in liquid assets.

Herding, Interconnectedness, and Contribution to Systemic Risk

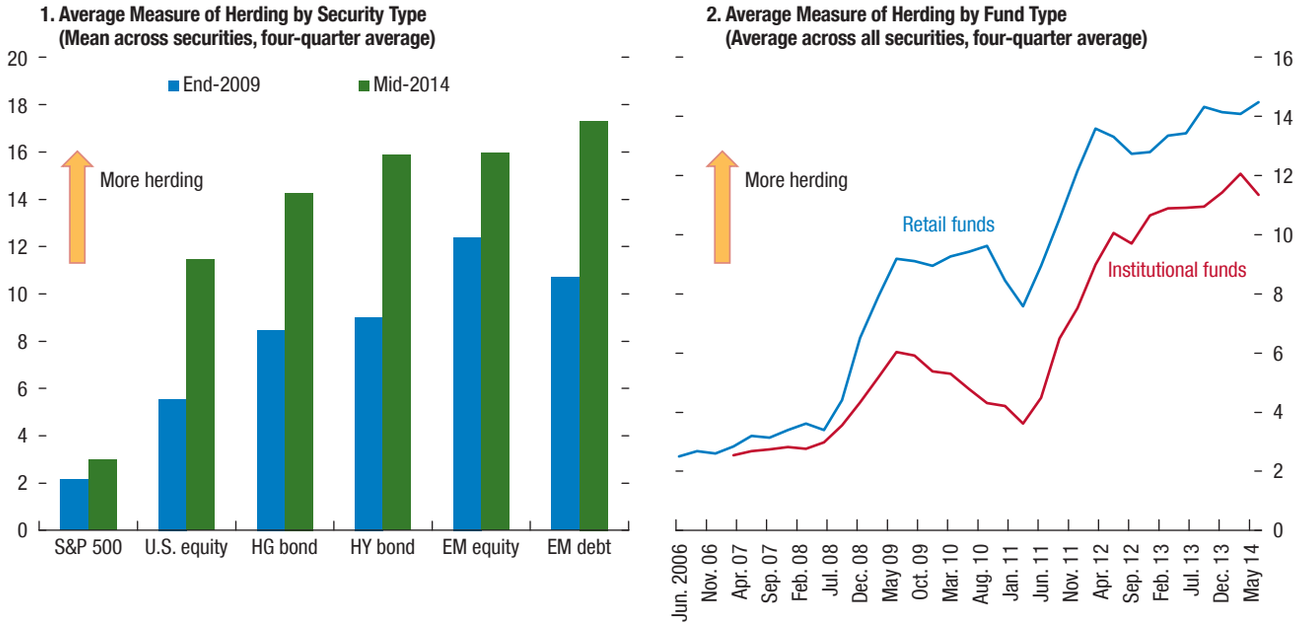
Herding (correlated trading)

How prevalent is herding? Empirical evidence of mutual fund herding is abundant, although reported mag-

Figure 3.13. Herding among U.S. Mutual Funds
(Percent)

Recently, U.S. mutual funds have been herding more in U.S. equity and corporate bond markets.

Retail funds tend to herd more than institutional funds.



Source: IMF staff estimates. Additional data: Calculated based on data from the survivor-bias-free U.S. mutual fund database ©2014 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business.
Note: EM = emerging market; HG = high grade; HY = high yield. The herding measure is that proposed by Lakonishok, Shleifer, and Vishny (1992). It assesses the strength of correlated trading among mutual funds investing in each security, controlling for their overall trade trends (see Box 2.5 of April 2014 *Global Financial Stability Report*). Note that the market as a whole cannot trade in the same direction, since at any given time there must be a buyer for each seller. The measure is 0 when there is no sign of herding among mutual funds. It is calculated every quarter, looking at the fund-level activity in each security, and then averaged across securities. The measure is computed when there are at least five funds that changed the holdings of a security in each quarter for each security. The CRSP database contains security-by-security holdings of all U.S.-domiciled open-end mutual funds, covering more than 750,000 securities. To make the analysis computationally feasible, this chapter works with subsamples of securities that are randomly selected. Except for the S&P 500 sample, the herding measure is calculated with 50,000 randomly selected securities for each of the subgroups. In panel 1, the difference in herding across neighbor categories is statistically significant at the 5 percent confidence level, except for the case of EM debt versus EM equity, and HY bond versus HG bond. The difference in herding by fund type (panel 2) is significant at the 1 percent confidence level.

nitudes vary across markets (Grinblatt, Titman, and Wermers 1995; Wermers 1999; Borensztein and Gelos 2003; Choi and Sias 2009; Brown, Wei, and Wermers 2013). Using data on security-by-security holdings of U.S. open-end mutual funds, the degree of herding is measured using the method developed by Lakonishok, Shleifer, and Vishny (1992).[31] This is a measure of correlated trading within this investor group. Even though it does not conclusively allow for an identification of "herding" in a strict sense (namely, actions taken only because investors see other investors taking them), at a minimum it does provide an informative measure of the degree to which this class of investors moves together, regardless of the underlying reasons.

Herding among U.S. mutual funds is on the rise across fund styles (Figure 3.13). This finding is true for both U.S. equities and corporate bonds in recent years. For U.S. equities, mutual funds appear to co-move more during distress episodes. Retail-oriented funds show consistently higher levels of herding than do institutional-oriented funds. This could be because retail investors are more prone to quickly reallocate money from funds with poor recent performance to funds with high recent returns (Frazzini and Lamont 2008), possibly because it is more difficult for them than for institutional investors to assess and monitor portfolio managers. This difficulty in assessing and monitoring managers and the result-

[31]See Box 2.5 in the April 2014 *Global Financial Stability Report* for details. The Lakonishok, Shleifer, and Vishny (1992) index is a highly robust measure for detecting herding (in the sense of correlated trading patterns). It does, however, have a bias toward underestimating the magnitude of herding. Correcting for this bias is difficult and methods for doing so are the subject of ongoing debate. The downward bias increases with lower transaction numbers. Given that over the past five years, the data show a mild decline in the number of transactions per security, the results likely underestimate the true increase in herding shown in Figure 3.1.

ing volatility of inflows would exacerbate the role of incentive problems described earlier in driving herding behavior. The rise in herding coincides with the adoption of unconventional monetary policies in the United States, and could be related to an accentuated search for yield by mutual funds.[32] Herding levels are higher for emerging market and high-yield assets and lowest for the S&P 500 market, consistent with the notion that herding is more likely to be prevalent in relatively more opaque and less liquid markets (Bikhchandani, Hirshleifer, and Welch 1992).

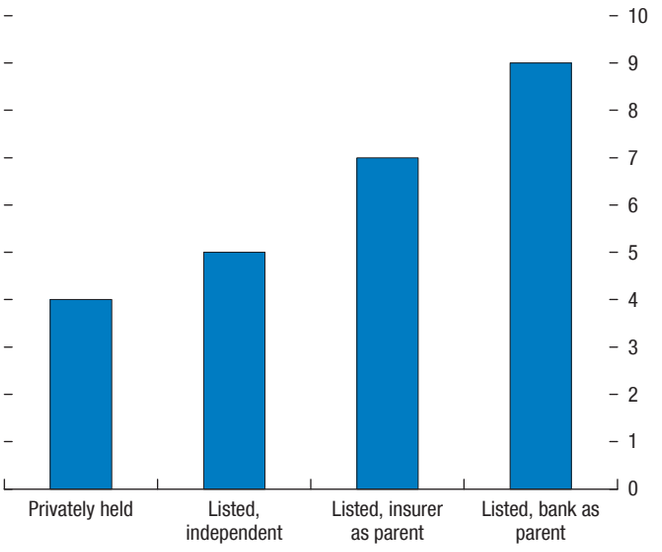
Linkages between parent asset management companies and funds

Mutual funds and most other investment vehicles have few direct solvency linkages with their AMCs. AMCs' own balance sheets are legally separated from those of the mutual funds they manage, as required by regulations.[33] This separation does not necessarily apply to other types of investment vehicles, though. For some hedge funds and private equity funds, AMCs' assets can be comingled with clients' assets. Another example of linkage is AMC parents' support for funds during crisis episodes. In 2008, because of reputational concerns, some financial institutions provided emergency liquidity support for money market funds and other fixed-income funds their group AMCs were managing (Moody's 2010).

Interconnectedness through ownership

Banks and insurance companies are major owners of AMCs, and the overall stability implications of these arrangements are unclear (Figure 3.14). Without proper oversight of related-party exposures and concentrated exposures, funds could be used as funding vehicles for their AMC's parent banks.[34] Moreover, many such banks are G-SIFIs. These interrelationships increase the concentration of financial services providers across various subsegments of the financial sector, creating potentially very influential and complex mega conglomerates. Information sharing between a bank and its group AMC is another potential concern. Massa and Rehman (2008) provide evidence that such information sharing exists for banks and AMCs, most likely through informal channels. However, bank affiliation could also have effects that may be desirable from a financial stability point of view, including access to a central bank's emergency liquidity facility through AMCs' parent banks and more supervisory scrutiny.

Figure 3.14. Ownership Structure of the 25 Largest Global Asset Management Companies
(Number)



Sources: Pensions and Investments and Towers Watson (2014); and IMF staff calculations.
Note: Parent banks include Amundi, Bank of New York Mellon, BNP Paribas, Deutsche Bank, Goldman Sachs, HSBC, J.P. Morgan Chase, Natixis Global Asset Management, and UBS. Parent insurance companies include Allianz (for PIMCO), Axa, Metlife, Generali, Legal and General Group, and Prudential.

Interconnectedness through bank funding

The roles of mutual funds as funding providers for banks appear to vary across instruments and countries (Figure 3.15). Mutual funds are more important providers of long-term bank financing in the United States than in other economies. However, their role appears to be less important than that of money market funds' role in short-term (bank) funding.

The relationship between size and contribution to systemic risk

An actively discussed question in global regulatory fora is whether large asset managers and funds should be designated as SIFIs and receive more intense oversight. This section does not intend to fully answer this ques-

[32]For high-grade bonds, econometric estimates of the relationship between herding and proxies for unconventional monetary policy show a positive, albeit weak, link.

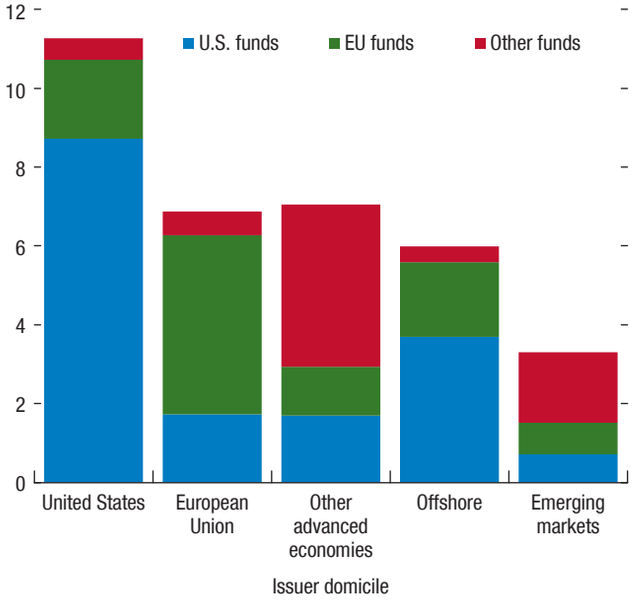
[33]See Annex 3.1. AMCs' own balance sheets are also much smaller than the clients' money they manage (2 percent to 12 percent of assets under management for the top AMCs).

[34]For instance, certain types of synthetic ETFs could be used by their AMCs' parent banks to obtain cash in exchange for collateral securities that banks do not want to keep on hand.

Figure 3.15. Bank Financing by Mutual Funds and Money Market Funds

Mutual funds invest in long-term bank bonds, but generally they are not the main holders of bank bonds…

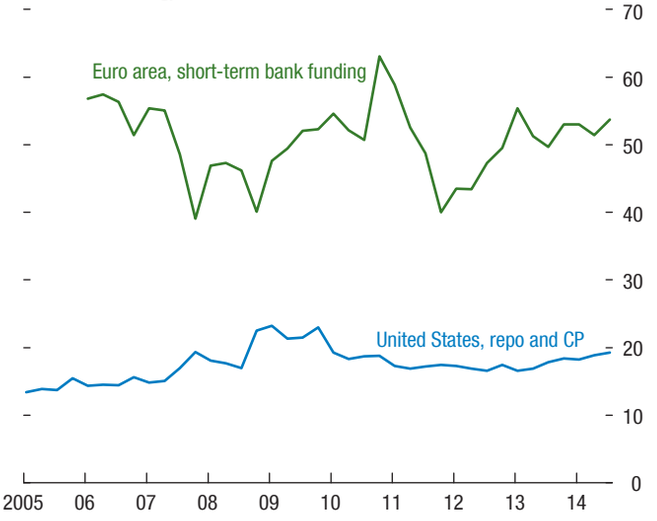
1. Share of Long-Term Bank Bonds Held by Mutual Funds (Percent of total outstanding covered in eMaxx)



Sources: eMaxx; and IMF staff calculations.
Note: EU = European Union.

…whereas money market funds play a more significant role in short-term funding markets.

2. Money Market Funds' Share in Short-Term Funding Markets (Percent of euro area short-term bank funding and U.S. repo and CP outstanding)



Sources: European Central Bank; Federal Reserve; and IMF staff estimates.
Note: CP = commercial paper; repo = repurchase agreement.

tion. As discussed earlier, each segment of the industry has its distinctive risks, many of which are hard to quantify because of data gaps. However, the analysis attempts to partially address the issue by asking how funds' contribution to systemic risk in advanced economies relates to fund size, investment focus, and size of their AMCs, using the conditional value-at-risk (CoVaR) method (see Annex 3.2).

Funds' contributions to systemic risk depend relatively more on their investment focus than on their size (Figure 3.16). Estimations based on a sample of about 1,500 funds (not shown) reveal that investment orientation, VaR, and fund size, among other characteristics, are significantly related to a fund's contribution to systemic risk (Annex 3.2). The relative importance of size, however, differs across market segments.

For a given fund size, the systemic risk contribution bears little relation to the size of a fund's AMC (Figure 3.16, panel 2). The average contribution to systemic risk does not increase with a fund's AMC's size (the picture looks the same when the investment focus of funds is controlled for), at least not for the top asset managers considered here. Although this exercise only examines one segment of the broad asset management industry and CoVaR is only one of the many possible systemic risk measures, it highlights the importance of incorporating product-line and investment-focus perspectives, in addition to mere size, when discussing the designation of AMCs and funds as SIFIs.

Revamping the Oversight Framework to Address Financial Stability Risks

Key Features of Current Regulation

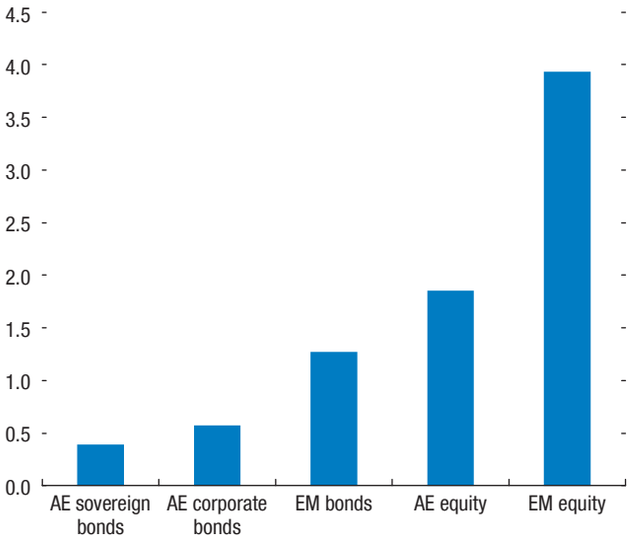
The industry is regulated, albeit with a focus on investor protection. Substantial regulatory requirements are in place for publicly offered funds.[35] Regulation focuses on investors being given sufficient information to understand the investment product, on investors'

[35]Regulatory frameworks for funds appear to be generally strong around the globe—the IMF and World Bank assessments of securities regulation under the IOSCO Principles show a generally high level of compliance with principles dealing with disclosure to investors and other consumer-protection-related standards. Some emerging market and developing economies, however, have serious gaps in their legal frameworks that fail to adequately separate the funds' assets from those of the asset manager. This raises risks to customer assets.

Figure 3.16. Contribution to Systemic Risk by Mutual Funds

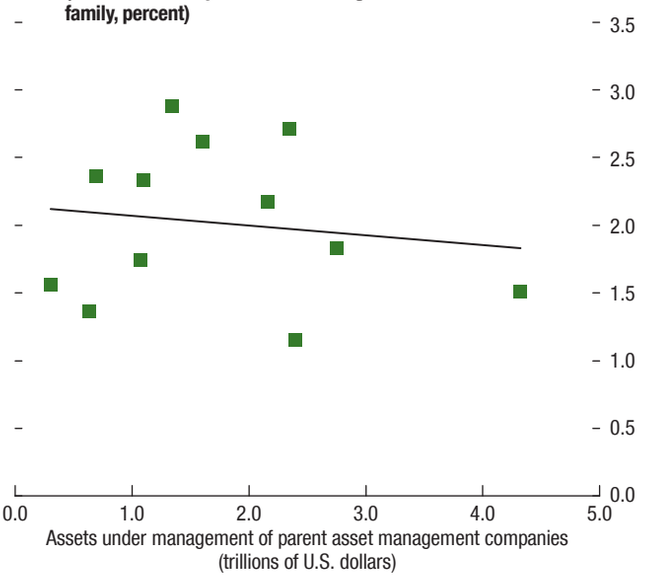
The systemic risk contribution differs across funds' investment orientations.

1. Average Contribution to Systemic Risk by Investment Focus (Percent)



A fund's systemic risk contribution is not related to its AMC's size.

2. Contribution to Systemic Risk of Top Fund Families by Size of Asset Management Company (Contribution to systemic risk averaged across funds in the same family, percent)



Sources: Lipper; Pensions and Investments and Towers Watson; and IMF staff estimates.
Note: AE = advanced economy; AMC = asset management company; CoVaR = conditional value-at-risk; EM = emerging market. The impact of fund A's distress on systemic risk is measured by the difference of CoVaR when fund A is in a normal state (median VaR) and in a distressed state (worst 5 percentile VaR). The financial system consists of an equity index for banks and insurers from AEs and about 1,500 mutual funds, taking the largest 100 funds (globally) for each of the five investment focus categories (AE sovereign, AE corporate bond, EM bond, AE equity, and EM equity) and for three different fund domiciles (the United States, Europe, and the other advanced economies). Weekly net asset value data are used to compute fund returns and monthly total net asset (TNA) data to measure the size of each fund from January 2000 to November 2014. The system is measured by a TNA-weighted average of fund returns (the results are robust when the simple average is used instead). The assets under management of the AMC include assets managed with different investment vehicles such as separate account and alternative funds. Caution should be taken in comparing the precise ranking of systemic risk contributions across fund categories since the sample period may not capture the realization of relevant tail risks. Moreover, the measure does not identify whether the contribution is causal or driven by a common factor.

assets being protected from fraud and other risks, and on asset managers not taking advantage of investors. For these purposes, disclosure, investment restrictions (including concentration limits), caps on leverage, liquidity risk management, pricing and redemption policies, and separation of client assets from those of AMCs play important roles (Table 3.3). Regulatory requirements for privately offered products have also been strengthened since the global financial crisis. AMCs that offer investment products are subject to rules that focus on protecting clients from fraud or negligence and that aim to ensure the business continuity of the AMC.

The importance of liquidity risks to the industry is recognized and is an integral part of current regulation and industry practices:

- Regulatory requirements to manage liquidity risks exist, though they are often rather general. Funds are generally restricted to liquid assets or required to maintain certain liquid asset ratios; they must have risk management frameworks (data collection, profiling of redemptions, and stress testing) in place. Many asset managers have internal liquidity risk management frameworks for their funds, with regular monitoring of clients' liquidity needs and stress testing. These liquidity management tools are in line with FSB suggestions (FSB 2013).
- For very large redemptions, funds also have a variety of tools, subject to local regulatory requirements. For macroprudential purposes, the FSB (2013) and the October 2014 *Global Financial Stability Report* suggest that regulation and fund contracts should include tools, such as fees, gates, side-pockets, and

Table 3.3. Selected Regulations for Publicly Offered Funds

Issues	Requirements
Investment Restrictions	• Typically, investments in illiquid securities and complex products are restricted and positions cannot be concentrated in a single issuer. • Use of leverage and derivatives is capped. Public funds in the United States, for example, can only employ leverage of up to 33 percent of assets, including portfolio leverage embedded in derivatives. UCITS funds can only temporarily borrow up to 10 percent of assets. UCITS funds can invest in financial derivatives, subject to conditions on underlying assets, counterparties, and valuation, and exposure cannot exceed the total net value of the portfolio.
Liquidity	• Publicly offered funds are subject to liquidity requirements. • Specific fund classes, such as money market funds, have extensive liquidity requirements. • In the United States, funds can hold only a limited amount of illiquid assets. "Liquid asset" is defined only broadly by regulation, but more detailed definitions can be included in fund contracts. • In the European Union, regulators provide a list of assets that are eligible to meet liquidity requirements, but there is no liquidity ratio requirement. A similar approach is followed by other jurisdictions, such as Brazil. • In Singapore, liquidity requirements differ by fund type. • Funds are expected to have risk management frameworks, including liquidity risk management, but few jurisdictions provide details on how these frameworks should work. • In 2011, IOSCO established its Principles of Liquidity Risk Management for Collective Investment Schemes.
Pricing of Fund Assets, Fund Shares, and Redemption	• Portfolios are generally priced at market value for NAV calculation, although some illiquid assets are valued following fair value accounting rules. However, during times of distress, some prices may not reflect accurate market values, especially when there are limited market transactions. • Rules are in place aiming to ensure that prices for purchases and redemption of shares are set so as to treat investors fairly, but some rules can result in a first-mover advantage (see Box 3.2 for details). • Various jurisdictions allow suspension of redemption as an extreme measure. • Under the European Union's UCITS scheme, funds can specify redemption restrictions, typically used for funds investing in less liquid securities.

Source: IMF staff.
Note: IOSCO = International Organization of Securities Commissions; NAV = net asset value; UCITS = Undertaking for Collective Investment in Transferable Securities (a type of publicly offered fund governed by the European Union UCITS directive).

suspension of redemptions, to manage large redemptions.[36] Existing regulation and fund contracts indeed allow for these tools. In addition, asset managers can make use of credit lines, delays in cash payout upon redemption (within regulatory limits), and payment in kind.[37] The available tools often vary depending on local requirements.[38] For extreme measures, such as suspensions, funds are usually required to obtain permission from regulators, and they are strictly limited to extraordinary circumstances to prevent abuse. Consequently, restrictions on redemptions have been used only rarely in advanced markets, and are generally associated with the failure or winding down of a fund—redemptions are suspended to ensure that pricing of the shares is fair across investors when a portfolio has become too difficult to price (IOSCO 2011).

[36]Gates constrain redemption amounts to a specific proportion on any one redemption day. Suspension is full closure of a fund to redemption. Side-pockets legally separate impaired or illiquid securities to prevent them from affecting a fund's return until market conditions stabilize.

[37]Asset managers argue that payment in kind is particularly useful for institutional clients. For instance, when institutional clients are simply changing portfolio managers, they are willing to accept securities instead of cash and transfer the securities to a new manager to avoid losses related to large-scale sales. Transfer of securities from one manager to another is straightforward because the securities are kept at a custodian bank, segregated from the AMC's assets.

[38]For instance, in some countries, funds are not allowed to take credit lines or pay in kind to retail investors. The minimum redemption frequency for publicly offered funds is set differently across jurisdictions, and funds are not allowed to delay settlement beyond the limit (seven days in the United States and two weeks in the European Union).

Limitations of Current Oversight

The current oversight framework is not set up to fully address risks, neither at the institutional nor systemic level:

- *Regulation lacking in specificity*—Key regulations, especially regarding liquidity requirements and liquidity risk management, are broad and lack specific guidance, allowing for wide-ranging interpretations and practices across jurisdictions (Table 3.3). For instance, liquid asset requirements are often stipulated without a precise definition of "liquid assets." Requirements for risk management frameworks are often not detailed in legislation. Regulatory requirements themselves also vary substantially across jurisdictions, reflecting the broad-principle-based approach of global standards (IOSCO Principles).
- *Insufficient supervision of individual and systemic risks*—Supervision of funds and asset managers

is generally weak across jurisdictions.[39] In many jurisdictions, oversight of funds has been focused on disclosure to protect retail investors. Regular supervision of risks is generally not the focus of supervisors.[40] As a result, no financial soundness indicators have been developed for the industry, and stress testing of funds and AMCs by regulators has been rare—a major contrast with bank supervisory practice. For some regulators, the number of asset managers and funds impose resource challenges. Moreover, international coordination and guidance on supervisory practices is sparse, since the IOSCO Principles focus on regulations. Good practices by asset managers provide some comfort, but in the presence of liquidity and price externalities, each fund and asset manager is likely to underestimate liquidity needs and the potential for correlated price effects in the presence of large shocks (Liang 2015).

Improving Oversight

Securities regulators should enhance the microprudential oversight of risks (Table 3.4):

- *Enhance regulation by providing more specifics for funds' liquidity requirements*—Key regulations should provide a clearer definition of liquid assets. More specific guidance should be given to match the liquidity profile of each fund category to its redemption policy.
- *Strengthen the microprudential supervision of risks related to individual institutions*—Regulators should regularly monitor market conditions and review whether funds' risk management frameworks are sufficient, especially with regard to liquidity risks. Greater resources should be devoted to supervising risks, including developing analytical and stress-testing capacities so that regulators can effectively challenge asset managers' practices.
- *Ensure that funds do not take excessive leverage*—Caps limit overall leverage of publicly offered funds. Nevertheless, leverage and its regulatory compliance should be regularly monitored with better data on derivatives.[41]
- *Adopt approaches based on products, activities, or both*—Focusing on activities and products in addition to size seems appropriate given that the industry is diverse and differences in investment focus seem to matter significantly for funds' contribution to systemic risk.
- *Raise the quality of supervisory practices across jurisdictions by introducing global standards*—International standards and guidelines for better supervision should be significantly expanded and enhanced. Supervisors should share best practices, especially in the area of liquidity risk. For instance, coordinated efforts should be undertaken to develop financial soundness indicators as well as stress-testing frameworks for the industry. The IMF could play a key role here, based on its experience in developing common financial soundness indicators and stress-testing frameworks for banks.[42]

A macroprudential perspective should be integrated into the oversight of the industry, and the adequacy of existing tools for macroprudential purposes should be reexamined:

- *Bring a macroprudential focus on systemic risk to oversight of the sector*—As illustrated by the empirical analysis, price externalities are the key channel of systemic financial stability risk from this industry. Thus, assessments of individual institutions are not sufficient for assessing systemic risk. Incorporating monitoring of linkages to other sectors that rely on the industry for financing may even be necessary.[43]
- *Existing risk management tools and rules could be used with a view to safeguard financial stability*—To

[39]A consistent finding in Financial Sector Assessment Programs of the IMF and the World Bank is that most jurisdictions with substantial asset management industries have sound regulatory frameworks but show weaknesses in the intensity of supervision of funds and asset managers.

[40]There are some exceptions. For instance, supervisors in France and Brazil have risk-oriented and data-driven financial stability risk management frameworks that foresee collecting the data and using them to monitor potential risks; the supervisors can conduct stress testing on their own, and challenge asset managers if risks are found.

[41]Adam and Guettler (forthcoming) document that, among U.S. corporate bond funds, (1) the use of credit default swaps (CDS) rose from 20 to 60 percent between 2004 and 2008; (2) CDS are mostly used to enhance credit risk taking, rather than hedging; (3) funds belonging to a larger fund family are more likely to use CDS; (4) underperforming funds often increase their CDS exposures to enhance returns; and (5) CDS users tend to perform worse on average than non-users.

[42]The *Global Financial Stability Report* began reporting financial soundness indicators for banks in 2003. At first, the data were collected from national authorities or commercial databases without harmonizing methods. The effort has since developed into a more harmonized statistical framework (http://www.imf.org/external/np/sta/fsi/eng/fsi.htm), with a full compilation guide. The IMF now periodically publishes details of the indicators. It has also been contributing to the building of common stress-testing frameworks (IMF 2012).

[43]The October 2014 *Global Financial Stability Report* discusses how cooperation between microprudential, macroprudential, and business conduct regulators could be carried out in practice.

Table 3.4. Summary of Analysis and Policy Implications for Mutual Funds and ETFs

Results	Policy Implications
Does Fund Investment Affect Asset Prices?	
Flow-price impact analysis: Fund flows affect aggregate asset prices, at least in less liquid markets, in both advanced and emerging market economies.	• Regulators need to monitor financial stability risks from the industry from a macroprudential perspective, especially in smaller, less liquid, fixed-income markets. • Adequacy of concentration limits may need to be reconsidered.
Concentration and price-impact analysis: Mutual funds' concentration in bond markets has risen. During stress episodes, bonds with more concentrated mutual fund ownership tend to experience larger price drops.	
What Drives Run Risk? What Can Be Done to Mitigate It?	
End investors: End investors, especially retail investors, chase past returns and display a flight to quality during times of stress, making fund flows procyclical.	• Properly pricing-in the cost of liquidity is important in reducing the first-mover advantage, by avoiding passing on to remaining investors the costs associated with the sales of illiquid assets. Regulators should examine the benefit of flexible NAV pricing rules (such as swing and dual pricing), illiquid asset valuation rules, and ETF structures to adequately reflect liquidity risk costs. • Consider imposing minimum redemption fees for funds with large liquidity mismatches. Fees that are added to NAV avoid harming investors as a whole, while pricing-in the cost of liquidity. • More generally, the adequacy of the requirements for liquid assets and liquidity risk management should be reexamined, incorporating financial stability risks from the industry.
First-mover advantage: In line with the notion of a first-mover advantage, among equity funds, redemptions are more sensitive to returns for less liquid funds. However, the same is not true for bond funds (which generally have higher liquidity mismatches than equity funds). In emerging markets, fund flows predict future price movements, consistent with a first-mover advantage.	
Funds' liquidity risk management: Funds use various liquidity management tools. They hold higher cash buffers when they experience large outflows, face higher redemption risks, are retail focused, and invest in illiquid assets. Fees are generally effective in reducing redemptions.	
Does Asset Managers' Behavior Amplify Risks?	
Managers' decision vs. end investors' decision: Portfolio managers' trading accounts for about 70 percent of the variance in funds' investments.	• Ensure that managers are in compliance with regulatory requirements and are not taking excess risks (including hidden leverage). • Reduce information gaps between managers and investors (and regulators) by upgrading disclosure requirements to better reflect the fund's economic risks, especially regarding the use of derivatives and securities financing transactions. • Financial stability risks from mutual funds could stem from many small funds taking similar positions. Regulators should pay attention to this possibility, not just focus on the positions of large funds.
Excessive risk taking: By rewarding winners disproportionately more than punishing losers, end investors encourage excessive risk taking by managers in various advanced economies. The tendency is stronger for equity funds than for bond funds.	
Herding: Herding among U.S. mutual funds has been intensifying, particularly in smaller, less liquid markets. Retail-investor-oriented funds tend to herd more.	
Brand name effects: Evidence suggests that large redemption shocks to a flagship fund often spill over to other funds in the family, although the effects have been weak so far.	
Contribution to Systemic Risk and Size	
Fund size and systemic risk: Generally, larger funds contribute more to systemic risk, but the investment focus of funds matters more.	• The SIFI discussion for funds and asset managers should take into account specific risks of products in addition to size. • Oversight of the industry should not simply focus on large funds and AMCs.
Parent AMC size and its funds' systemic risk: There is little relationship between a fund's contribution to systemic risk and its AMC's size.	

Source: IMF staff.
Note: AMC = asset management company; ETF = exchange-traded fund; NAV = net asset value; SIFI = systemically important financial institution.

mitigate price externalities, rules on investment restrictions (such as concentration limits), liquidity requirements, and redemption policies may need to be updated in line with funds' risk profiles (October 2014 *Global Financial Stability Report*).

- *Further efforts should be aimed at reducing the first-mover advantage*—As discussed, and partly confirmed in the empirical analysis, a first-mover advantage can arise for various reasons. Some of these are difficult to address, such as the liquidity pecking order of sales. Others, however, such as the degree of liquidity mismatches, can at least partially be addressed with good supervision. Most important, accounting-based illiquid asset valuation rules and inflexible fund share pricing rules that increase investors' incentives to run should be revised. In this context, so-called swing- or dual-pricing rules could play a role (Box 3.2). Charging redemption fees, which are found to be effective

in smoothing redemptions, is another alternative for pricing-in the cost of liquidity. However, competitive pressures have probably resulted in fee levels that are likely too low from a financial stability perspective (Figure 3.10, panel 4). Therefore, coordinating on an industry-wide minimum level of fees for funds investing in illiquid assets could be considered.[44] In doing so, fee policies should match funds' specific characteristics rather than impose one-size-fits-all requirements.[45]

- *Caution is needed in the use of gates and suspensions*—They should be part of the toolkit. Nonetheless, their imposition may also send negative signals to the market and lead to preemptive runs ahead of the instruments coming into force (FSB 2013; October 2014 *Global Financial Stability Report*).
- *Be equipped with "better" data*—Publicly offered funds disclose substantial information. However, the disclosed data—aimed at investor protection—are often not sufficient for nor suited to systemic financial stability analysis. For instance, many jurisdictions do not require standardized quantitative disclosure of derivatives and securities financing transactions, such as outstanding positions, details on collateral, and counterparties.[46] Better disclosure and reporting is also important for reducing information gaps that lead to incentive problems of delegated portfolio management. Supervisors should also make further efforts to collect data on privately offered products, including separate accounts. Even though investor-protection concerns with regard to these products are lower, their investment patterns can affect financial markets.

[44]These fees would not have to benefit the AMC but could be added to NAV and be redistributed to investors. For instance, in the United States, Rule 22c-2 under the 1940 Investment Company Act as amended provides that the fund board of an open-end fund must consider whether to impose a redemption fee (up to 2 percent) that flows back into the fund's NAV (BlackRock 2014b).

[45]Nevertheless, the imposition of such a fee would raise various practical problems, including those related to cross-border coordination. An inadequate framework could also drive investors away from this industry to other, less regulated products.

[46]In the United States, mutual funds disclose only qualitative information on their derivatives positions. In the European Union, heightened concerns about the use of derivatives by synthetic ETFs in 2011 (see Annex 3.1) have led the industry to voluntarily disclose detailed derivatives positions, including derivatives exposures, counterparties, and the type and amount of collateral. This practice has subsequently evolved into requirements for ETFs and more broadly for UCITS (ESMA 2012). In Brazil, supervisors obtain information from the central counterparty and from exchanges that clear derivatives transactions.

Various other aspects not covered in the empirical analysis in this chapter deserve attention by national authorities. Improving the liquidity and transparency of secondary markets, specifically for longer-term debt markets, would reduce risks related to liquidity mismatches.[47] For example, expanding trade reporting initiatives to all global fixed-income sectors should help reduce the opacity of secondary markets (October 2014 *Global Financial Stability Report*). Compensation structures for portfolio managers may merit scrutiny (Box 3.1). The composition of benchmark indices also deserves attention, with a view to minimizing possible associated distortions. The authorities could assess their ability to provide emergency liquidity to break vicious feedback loops between funding and market liquidity in times of stress. However, providing emergency liquidity creates clear moral hazard risk and therefore requires enhanced supervision (October 2014 *Global Financial Stability Report*).

Conclusion

Financial stability risks can emanate from intermediation through asset managers even in the absence of leverage and guaranteed returns. The discussion in this chapter stresses the importance of separating the effects that stem from end investors, and would be present even in the absence of financial intermediaries, from those that are introduced by the presence of asset managers. The delegation of day-to-day portfolio management introduces fundamental incentive problems between end investors and fund managers, which can induce destabilizing behavior and amplify shocks. In addition, easy redemption options can create risks of runs because of the presence of a first-mover advantage. The destabilization of prices in certain asset segments (particularly bonds) can affect other parts of the financial system through funding markets and balance sheet and collateral channels.

The chapter has shed some light on the importance of various dimensions of these risks. Complementing and expanding on existing studies, the analysis finds evidence consistent with the notion that mutual fund investments affect asset price dynamics, at least in less liquid markets. Some factors point to the existence of incentives to run in segments of the industry. The observed pattern of fund inflows and redemptions by end investors creates incentives for fund managers to herd and, in

[47]Evidence suggests that herding declines with transparency (Gelos 2011).

some markets, for poorly performing fund managers to increase risk. Indeed, herding among U.S. mutual funds has been rising across asset markets. Funds managed by larger AMCs do not necessarily contribute more to systemic risk; investment focus appears to be relatively more important than size when gauging systemic risk.

Although these risks are not fundamentally new, their relevance has risen with structural changes in the financial sectors of advanced economies. The relative importance of the asset management industry has grown, and banks have also retrenched from many market-making activities, contributing to a reduction in market liquidity. Moreover, the role of fixed-income funds, which entail larger contagion risks than traditional equity investment, has expanded considerably. A broader range of products are available to less sophisticated investors. Last, the prolonged period of low interest rates in advanced economies has resulted in a search for yield, which has led funds to invest in less liquid assets.

The chapter offers five main policy messages:

- First, securities regulators should enhance microprudential supervision of risks stemming from individual institutions building on regulators' own risk analysis and stress testing, supported by global standards for supervision and better data and risk indicators.
- Second, regulatory and supervisory reforms are needed to incorporate a macroprudential approach.
- Third, liquidity rules, the definition of liquid assets, investment restrictions, and reporting and disclosure rules could be enhanced.
- Fourth, consideration should be given to the use of tools that adequately price-in the cost of liquidity, including minimum redemption fees, improvements in illiquid asset valuation, and mutual fund share pricing rules.
- Fifth, given that the industry is diverse and that differences in investment focus seem to matter significantly for funds' contribution to systemic risk, a product- or activity-based emphasis seems to be important.

Annex 3.1. Primer on the Asset Management Industry

Investment vehicles are broadly separated into "collective investment schemes" (referred to as "funds" in this chapter) that pool money from a number of investors and invest in financial assets, and what are called "separate accounts" or "discretionary mandates" that manage the money of single institutional investors or high net worth individuals (Annex Table 3.1.1). Collective investment schemes are further divided into various products. Most of them are open-end mutual funds investing in equities (Annex Figure 3.1.1).

Funds are often established as legal entities (corporations or trusts) that must be separated from an asset manager, and a fund's assets are kept at a custodian, segregated from the assets of AMCs (Annex Figure 3.1.2). This segregation of an AMC and the funds it manages is a key component of the regulatory framework for investor protection.

Annex Table 3.1.1. Features and Risk Profiles of Key Investment Vehicles

Vehicle	Features and Risk Profiles
Separate Account	• Providers of separate account services privately manage the money of institutional investors (including pension funds, insurance companies, and sovereign wealth funds) or high net worth individuals. • Little is known about this segment because contracts are private and can vary substantially across clients. • An industry survey (SIFMA 2014) indicates that these accounts entail simple securities portfolios with little leverage. The accounts are also subject to client investors' regulatory requirements. • Redemption risk for this group is moderate because institutional investors tend to internalize the cost of their sales, and large redemptions can be paid in kind (especially if clients are changing asset managers).
Open-End Mutual Fund	• These funds issue "redeemable equity securities" and stand ready to buy back their shares at their current net asset value (NAV)—the price per share of a fund. • These funds invest in generally liquid publicly traded bonds and equities. • Many of the funds offer daily liquidity to clients, making liquidity risk the key risk for the fund. • In particular, some funds invest in relatively illiquid securities (for example, corporate bonds instead of equity). This is often referred to as "liquidity transformation" that could lead to "liquidity mismatch," which makes the fund vulnerable to redemptions. • These funds have little leverage through borrowing, though they could be taking portfolio leverage using derivatives (the same applies for money market funds and exchange-traded funds, below). Although regulations impose caps on the use of leverage, little quantitative information is available.
Closed-End Mutual Fund	• These funds issue a fixed number of shares in the primary market that trade intraday on the secondary stock market at market-determined prices. Investors buy or sell shares through a broker, but cannot redeem their shares directly from the fund, so these funds do not suffer much liquidity risk. • However, their popularity suffers from the fact that their shares are usually traded in the secondary market at a lower value than their NAV. • Many closed-end funds borrow additional money, often using preferred shares, and they also take portfolio leverage, subject to regulatory limits (ICI 2014a).
Money Market Fund (MMF)	• These funds invest in short-term cash equivalent instruments such as commercial paper, Treasury bills, and certificates of deposit, and play a major role in short-term funding markets. • MMFs experienced major runs and liquidity distress during the global financial crisis. All U.S. MMFs offered constant NAV (mutual fund price per share) at $1 per share. This structure created a first-mover advantage because funds continued to honor the $1 per share repayment even though their actual NAV was worth less as the result of losses from asset-backed commercial paper, which was perceived to be liquid and safe before the crisis. • Constant NAV MMFs continue to exist in the United States and several other jurisdictions.
Exchange-Traded Fund (ETF)	• ETF shares are traded in primary and secondary markets (see Box 3.2 for details). • ETF shares can be created or redeemed in the primary market between the fund and "authorized participants" (APs) in large units. APs are typically large securities dealers. Only primary market transactions cause fund flows to ETFs. The settlement between ETFs and APs are usually in kind, meaning that the exchange of ETF shares and the basket of securities is in line with the ETF's investment objectives. • APs then trade the ETF shares in the secondary market with clients and counterparties on stock exchanges. This intraday trading in secondary markets provides intraday liquidity to end investors. • Most ETFs are index funds, tracking the performance of a specific index.
Synthetic ETF	• Synthetic ETFs are offered mainly in Europe. • Instead of directly holding underlying assets (called physical ETFs), synthetic ETF returns are generated using derivatives, especially swaps. • Synthetic ETFs could be used for various investment strategies, ranging from simple index tracking to leveraged and short-selling strategies. • The extensive use of derivatives (asset swaps) has led to strong concerns about portfolio leverage, counterparty risks, and the quality of collateral for asset swaps. A number of official sectors expressed such concerns in 2011, including the Financial Stability Board (2011) and the IMF. • In response, many ETF providers reduced synthetic products and expanded the disclosure of derivatives positions, including a list of counterparties and the collateral basket for asset swaps (Morningstar 2012).

(continued)

Annex Table 3.1.1. Features and Risk Profiles of Key Investment Vehicles *(continued)*

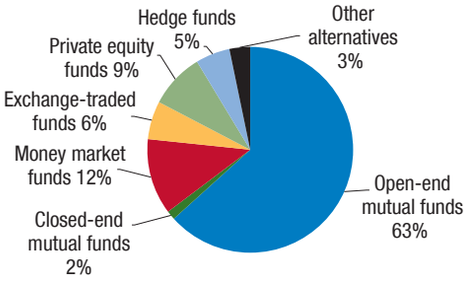
Vehicle	Features and Risk Profiles
Private Equity Fund	• Private equity is a broad term that refers to any type of equity participation in which the equity is not freely tradable on a public stock market, such as equities of private companies and public companies that are delisted. • Private equity funds often monitor and participate in managing the companies whose equity they hold. They aim to maximize financial returns by a sale or an initial public offering of the companies. • There are four main subclasses among private equity funds: (1) *venture capital* that invests in early-stage, high-potential, growth startup companies; (2) *buyout funds* that acquire existing business units or business assets; (3) *mezzanine funds* that invest in both growth equity and the subordinate debt layer—namely, the "mezzanine" between senior debt and equity—of buyout transactions; and (4) *distressed asset funds,* which are a specialized segment of buyouts that target mature and distressed companies. In addition, there are real estate and infrastructure funds. • Some private equity funds could be leveraged, but they are smaller components of the private equity industry (Metrick and Yasuda 2011). • Moreover, these alternative investment vehicles offer limited liquidity to end investors, matching the funds' long-term investment horizon. • Contagion risks are also limited because private equity funds invest in companies not traded in markets.
Hedge Fund	• These funds cover a large variety of investment strategies, ranging from publicly traded equity (highly liquid holdings) to distressed debt vehicles and structured credit products (highly illiquid holdings). Use of leverage and derivatives also varies considerably depending on the strategy. Unlike mutual funds, hedge funds have no cap on leverage. • Hedge funds tend to be more nimble than mutual funds regarding their investment strategy, leading to potentially rapid alterations in their risk characteristics. Depending on their funding and trading strategies, there can be significant interconnection with other financial institutions.

Sources: ICI (2014a, 2014c); Metrick and Yasuda (2011); Morningstar (2012); TheCityUK (2012); and IMF staff.

Annex Figure 3.1.1. Investment Vehicles by Size, Domicile, and Investment Focus

Most assets are managed with simple investment vehicles.

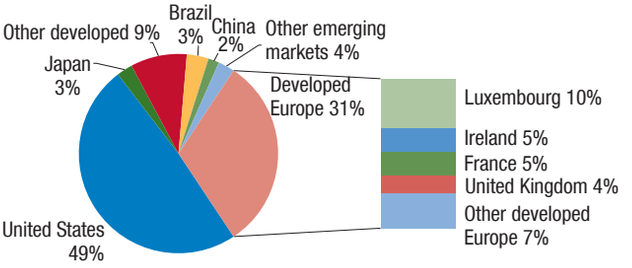
1. Investment Vehicles
(Percent of $43 trillion total assets under management, end-2013)



Sources: BarclayHedge; European Fund and Asset Management Association; ETFGI; Organisation for Economic Co-operation and Development; Preqin; and IMF staff calculations.

The mutual fund industry is dominated by U.S. and European funds, but Brazil and China show a notable presence among emerging markets.

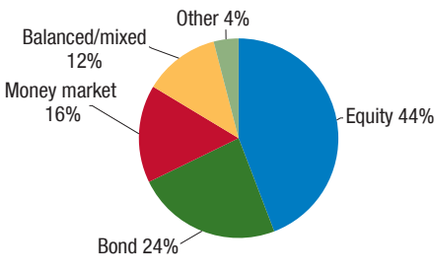
2. Mutual Funds by Fund Domicile
(Percent of $32 trillion total assets under management, 2014:Q2)



Sources: European Fund and Asset Management Association; and IMF staff calculations.

Most mutual funds invest in equities. (Bond funds, especially high-yield corporate and emerging market debt funds, are smaller components).

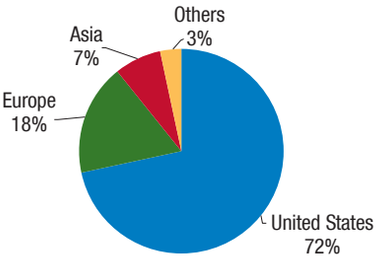
3. Mutual Funds by Investment Focus
(Percent of $30 trillion total assets under management, end-2013)



Sources: European Fund and Asset Management Association; and IMF staff calculations.

Exchange-traded funds are offered predominantly in the United States, where the use of exotic structures is restricted.

4. Exchange-Traded Funds by Region
(Percent of $2.3 trillion total assets under management, end-2013)



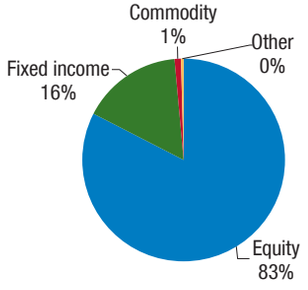
Sources: Deutsche Bank; and IMF staff calculations.

(continued)

Annex Figure 3.1.1. Investment Vehicles by Size, Domicile, and Investment Focus *(continued)*

Exchange-traded funds primarily invest in equities.

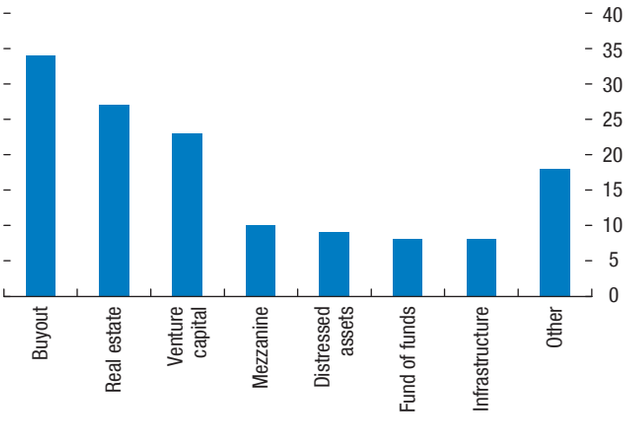
5. Exchange-Traded Funds by Investment Focus
(Percent of $2.3 trillion total assets under management, end-2013)



Sources: Deutsche Bank; and IMF staff calculations.

A large number of private equity funds are involved in buyout, venture capital, and real estate funds.

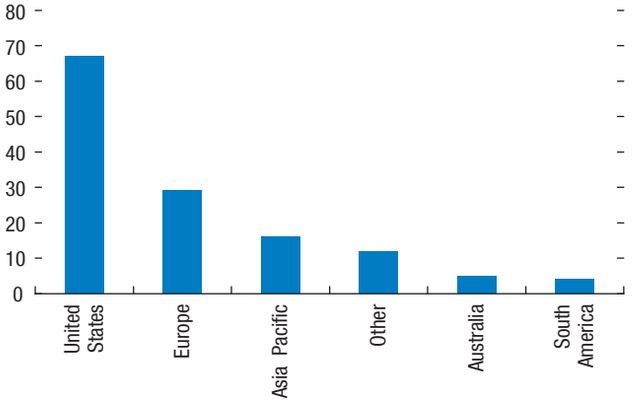
6. Private Equity Funds by Type
(Percent of total number of funds participating in Preqin's survey 2014)



Source: Preqin.
Note: Some funds are involved in multiple investment strategies.

Private equity funds are primarily located in the United States and Europe.

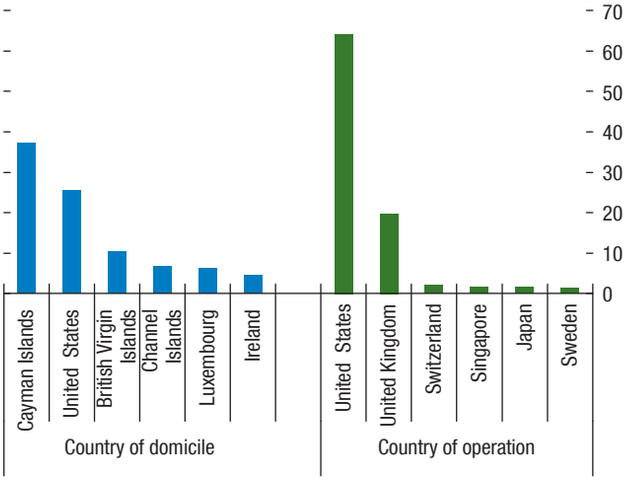
7. Private Equity Funds by Location of Offices
(Percent of total number of funds participating in Preqin's survey, 2014)



Source: Preqin.
Note: Some funds have offices in multiple countries.

A large number of hedge funds are domiciled in off-shore jurisdictions.

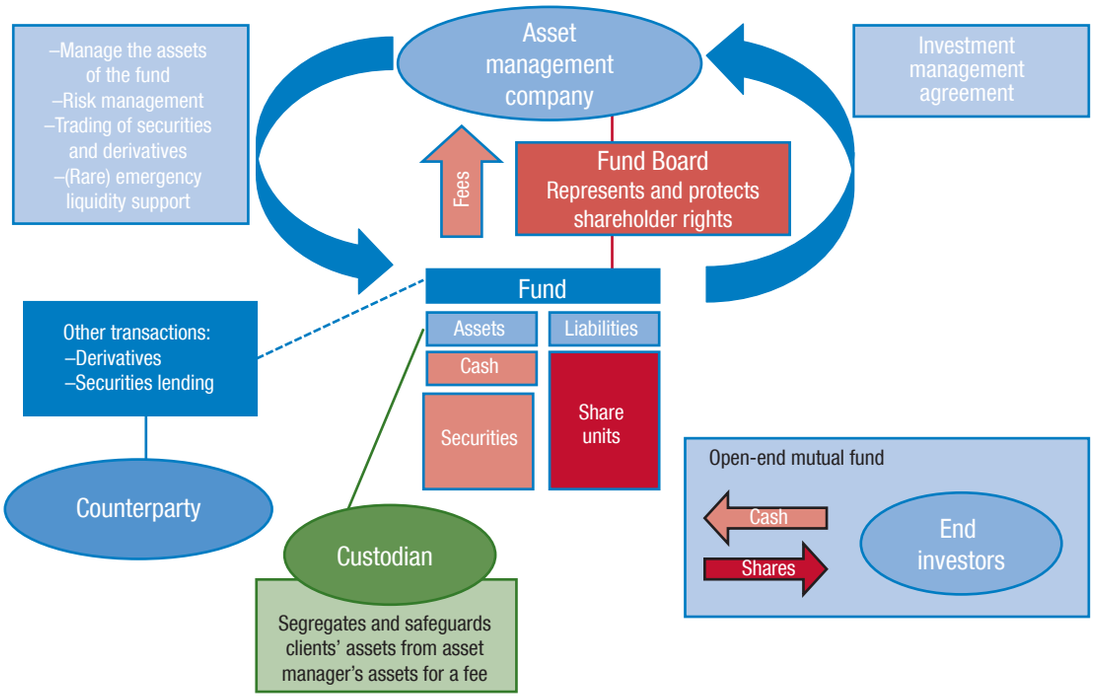
8. Hedge Funds by Country
(Percent of $1.4 trillion total assets under management covered in Hedge Fund Research, 2014)



Sources: Hedge Fund Research; and IMF staff calculations.

Annex Figure 3.1.2. Operation of a Fund

A fund signs an investment management agreement with an asset management company (AMC), which manages the fund's portfolio, risks, trading of securities, and securities financing transactions. End investors are equity shareholders of a fund and are the owners of the funds' assets in the sense that each share represents an investor's proportional ownership of the fund's asset holdings and the income those assets generate. However, end investors do not have full control over a fund. They typically cannot ascertain the exact makeup of a fund's portfolio at any given time, nor can they directly influence which securities the fund manager buys and sells or the timing of these trades. Fund boards represent and protect shareholder rights vis-à-vis AMCs.



Source: IMF staff.
Note: Examples of asset management companies are BlackRock, Franklin Templeton, and PIMCO; examples of funds are BlackRock iShare Core S&P 500 ETF and PIMCO total return funds. Custodians are usually large banks such as Bank of New York Mellon, J.P. Morgan, and State Street. Funds often lend the securities they hold to various counterparties to earn fee income (securities lending). Securities borrowers usually provide cash collateral. Counterparties are usually investment banks, prime brokers, and other broker-dealers that are engaged in short-selling of the borrowed securities.

Annex 3.2 Empirical Framework

Aggregate flow-price relationship

The aggregate flow-price relationship analysis examines whether mutual fund flows have an impact on asset prices at the macro level. Mutual fund flows to 23 emerging markets[48] are investment flows into each country from all mutual funds from various jurisdictions covered by EPFR Global. U.S. fund flows data are investors' flows into mutual funds with a stated investment focus, covering funds domiciled in the United States. U.S. data are from ICI, except for U.S. high-yield bond funds data, which come from EPFR Global. The analyses investigate weekly flows, but the results are similar using monthly flows. The price impact is measured by the total excess return of the respective index for each asset class in dollar terms over the one-month Eurodollar deposit rate.

The analysis here focuses first on surprise flows following Acharya, Anshuman, and Kumar (2014). As shown in the fund flows analysis later in this annex, mutual fund investors chase past returns, making fund flows predictable to some extent. Markets are likely to have priced in the effects from predictable flows by the time the money arrives, which limits the correlation between flows and returns. One would instead need to examine the part of fund flows that is not priced in the market. Surprise flows are estimated as residuals μ_{Fjt} for each asset class j from the following vector autoregression (VAR) model with the Chicago Board Options Exchange Market Volatility Index (VIX) as an exogenous variable.

$$\begin{bmatrix} R_{jt} \\ F_{jt} \end{bmatrix} = \mathbf{A} + \boldsymbol{B_1}\begin{bmatrix} R_{jt-1} \\ F_{jt-1} \end{bmatrix} + \cdots + \boldsymbol{B_p}\begin{bmatrix} R_{jt-p} \\ F_{jt-p} \end{bmatrix}$$

$$+ \boldsymbol{\gamma_0} VIX_t + \cdots + \boldsymbol{\gamma_q} VIX_{t-q} + \begin{bmatrix} \mu_{Rjt} \\ \mu_{Fjt} \end{bmatrix} \quad (3.1)$$

R_t and F_t are excess index return and fund flows, respectively, and p and q are the lengths of lags. For U.S. assets, the model is estimated with a standard VAR. For emerging market assets, a panel VAR excluding the VIX is applied. The details of the variable definitions are given in Annex Table 3.2.1.

Various single-equation models are estimated to investigate the relationship between surprise flows and asset returns. More specifically, the following models are estimated for each asset class j, using a panel regression with country fixed effects and robust standard errors (with clusters to correct for heterogeneity within countries, in addition to cross-country heterogeneity) for mutual fund flows into emerging market assets, and ordinary least squares (with Newey-West standard errors corrected for autocorrelation and heteroscedasticity) for end investor asset flows into U.S. mutual funds.

Base model:

$$R_{jt} = \alpha + \sum_{p=1}^{P} \beta_p R_{jt-p} + \sum_{q=0}^{Q} \gamma_q \hat{\mu}_{Fjt-q} + \sum_{r=0}^{R} \delta_r VIX_{t-r}$$

$$+ \sum_{s=0}^{S} \theta_s \, Asset\ Volatility_{jt-s} \quad (3.2)$$

Model with asymmetry:

$$R_{jt} = \alpha + \sum_{p=1}^{P} \beta_p R_{jt-p} + \sum_{q=0}^{Q} \{\gamma_{1q} \hat{\mu}_{Fjt-q} + \gamma_{2q} \hat{\mu}_{Fjt-q}$$

$$\times Indicator(1 \ if \ \hat{\mu}_{Fjt-q} > 0)\} + \sum_{r=0}^{R} \delta_r VIX_{t-r}$$

$$+ \sum_{s=0}^{S} \theta_s \, Asset\ Volatility_{jt-s} \quad (3.3)$$

Model with nonlinearity by the levels of the VIX:

$$R_{jt} = \alpha + \sum_{p=1}^{P} \beta_p R_{jt-p} + \sum_{q=0}^{Q} \gamma_{1q} \hat{\mu}_{Fjt-q} + \gamma_2 \hat{\mu}_{Fjt}$$

$$\times Indicator(1 \ if \ VIX_t > Threshold_j)$$

$$+ \sum_{r=0}^{R} \delta_r VIX_{t-r} + \sum_{s=0}^{S} \theta_s \, Asset\ Volatility_{jt-s} \quad (3.4)$$

in which $\hat{\mu}$ is the estimated residual in equation 3.

In addition, the section examines the dynamic relationship between unadjusted (that is, nonsurprise) flows and returns to assess the presence of a first-mover advantage. The analysis is based on generalized impulse response functions from VARs as in equation (3.1). In addition, impulse responses based on Cholesky decompositions using both possible orderings were computed.

Concentration and its effects on bond yields

The concentration analysis is based on the Lipper eMaxx bond ownership data, as used in Manconi, Massa, and Yasuda (2012). This database contains details of institutional holdings for each fixed-income security, covering $7 trillion in total fixed-income secu-

[48]Economies include current emerging markets as well as "graduated" emerging markets that were considered to be emerging at some point during the sample period. For equities, the sample includes Argentina, Brazil, Chile, China, Colombia, the Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Jordan, Korea, Malaysia, Mexico, Pakistan, Peru, the Philippines, Poland, Russia, South Africa, Taiwan Province of China, and Turkey. For bonds, the sample additionally includes Bulgaria, Lebanon, Sri Lanka, Ukraine, Uruguay, and Vietnam, but excludes the Czech Republic, India, Israel, Jordan, Korea, and Taiwan Province of China.

Annex Table 3.2.1. List and Definition of Variables for Empirical Exercises

Variables	Description	Data Source
Aggregate Flow and Return Analysis		
EM equity flows	Weekly mutual fund equity investment flows into each economy from all mutual funds covered by EPFR Global.	EPFR Global
EM bond flows	Weekly mutual fund bond investment flows into each economy from all mutual funds covered by EPFR Global.	EPFR Global
U.S. equity flows	Flows from end investors to U.S.-domiciled mutual funds investing in domestic equities.	ICI
U.S. bond flows, all bonds	Flows from end investors to U.S.-domiciled mutual funds investing in domestic bonds (both government and corporate).	ICI
U.S. HY corp. bond flows	Flows from end investors to mutual funds investing in U.S. high-yield corporate bonds.	EPFR Global
U.S. muni. flows	Flows from end investors to U.S.-domiciled mutual funds investing in municipal bonds.	ICI
EM equity returns	MSCI country equity index.	Bloomberg, L.P.
EM bond returns	Country index from J.P. Morgan EMBIG Global Index.	Bloomberg, L.P.
U.S. equity returns	MSCI country equity index.	Bloomberg, L.P.
U.S. bond returns, all bonds	Bank of America Merrill Lynch total return index for U.S. government and corporate bonds.	Bloomberg, L.P.
U.S. HY corp. bond returns	Bank of America Merrill Lynch total return index for U.S. high-yield corporate bonds.	Bloomberg, L.P.
U.S. muni. returns	Bank of America Merrill Lynch total return index for U.S. municipal bonds.	Bloomberg, L.P.
Benchmark yield	One-month Eurodollar deposit rate.	Bloomberg, L.P.
VIX	Chicago Board Options Exchange Market Volatility Index.	Bloomberg, L.P.
Asset volatility	Staff estimates based on asset returns data and GARCH in mean model.	IMF staff
Price Impact of Concentration in Bond Markets		
Spread	Bond yield minus the yield of benchmark sovereign bond with the same currency and similar maturity.	Bloomberg, L.P.
Concentration	Share of bonds held by the largest five mutual fund investors for each bond. Quarterly.	eMaxx
Bid-ask spread	Bid-ask yield spreads for each bond (end of quarter).	Bloomberg, L.P.
Modified duration	Computed from bond's yield to maturity, coupon rate, and time to maturity, assuming semi-annual distributions (end of quarter).	Bloomberg, L.P.
Issue size	Log of issuance size.	eMaxx
Covenants ratio	The number of covenants attached to a bond relative to a maximum of 18.	Bloomberg, L.P.
Drivers of Fund Flows and Liquidity Risk Management		
Fund flow	For each fund (i) and time (t), fund flows (it) = [TNA(it)–TNA(it–1)×{1+return(it)}]/ TNA(it–1). Return(it) is computed by CRSP based on NAV. Monthly.	CRSP
Performance	Monthly excess fund return (changes of NAV) over benchmark, averaged over prior three months.	CRSP
Benchmark performance	Monthly return of benchmark index, averaged over prior three months. The same benchmark is assigned for funds with the same broad investment focus (for instance, S&P 500 for U.S. domestic equity funds).	DataStream L.P.
HIGH_VIXD	High VIX dummy equals 1 when VIX > 30 percent.	DataStream L.P.
Cash	Cash and cash equivalents holdings in percent of total portfolio. Quarterly.	CRSP
Flow volatility	Standard deviation of flows over the prior 12 months, divided by the mean flows over the same period.	CRSP
Fund Characteristics		
Size (S/M/L)	Dummies based on 20th and 80th percentiles.	CRSP
Age	Years since initial offer.	CRSP
Purchase fee	Maximum in prospectus.	CRSP
Redemption fee	Maximum in prospectus (sum of type R [redemption] and C [contingent deferred sales charge]).	CRSP
Index dummy	1 if index fund.	CRSP
ETF dummy	1 if ETF.	CRSP
Institutional dummy	1 if institutional but not retail in CRSP.	CRSP
Liquid bond fund dummy	1 if a fund's investment focus is one of the following: short-term U.S. government funds and Treasury funds or short-term investment-grade debt funds.	CRSP
Illiquid bond fund dummy	1 if a fund's investment focus is one of the following: corporate debt BBB rated funds, EM local currency debt funds, EM debt funds, or high current yield funds.	CRSP
Liquid equity fund dummy	1 if a fund investment focus is S&P 500.	CRSP
Illiquid equity fund dummy	1 if a fund's investment focus is one of the following: micro/small cap funds; equity global small company; equity international small company; emerging markets, China, India, and Latin America.	CRSP

Note: corp. = corporate; CRSP = Survivor-bias-free U.S. mutual fund database, Center for Research in Security Prices; EM = emerging market; ETF = exchange-traded fund; HY = high yield; ICI = Investment Company Institute; EMBIG = Emerging Markets Bond Index Global; GARCH = generalized autoregressive conditional heteroscedasticity; muni. = municipal; S/M/L = small, medium, large; VIX = Chicago Board Options Exchange Market Volatility Index.

rities (based on par value) held by more than 19,000 funds. Institutional investors covered in the database are U.S. and some European insurance companies; U.S. mutual funds; top U.S. public pension funds; and European, Canadian, and Asian mutual funds. Data are based on disclosure information of security-level holdings by these institutional investors (especially for mutual funds and U.S. insurance companies). This analysis focuses on a subcomponent of these data, specifically corporate bonds for advanced economies and both sovereign and corporate bonds for emerging market economies.

The casual observation on the effects of ownership concentration on spreads in Figure 3.7 is confirmed with formal empirical analysis, reported in Annex Figure 3.2.1. The dependent variable is the change in individual bond yield spreads over a benchmark sovereign bond yield with the same currency and similar maturity between 2008:Q2 and 2008:Q4 and between 2013:Q1 and 2013:Q2. This change is regressed on various control factors and measures of mutual fund sector concentration. The following cross-section model is estimated using a quantile regression approach (for quantile j=10th, 25th, 50th, 75th, 90th percentile), because a preliminary analysis indicates the presence of nonlinearities between the dependent and independent variables (see Annex Table 3.2.1 for the list of variables):

$$\Delta Spread_{ij} = \alpha_j + \beta Spread_{ij,t=0} + \gamma Bond\ Characteristics_{ij,t=0} + \delta Concentration_{ij,t=0} \quad (3.5)$$

Control factors are *Spread*, which is the initial level of the yield spread to control for the credit risk of the security; and bond-specific characteristics, including liquidity (bid-ask spread), bond price sensitivity to interest rate changes (duration), issue size, and covenants, in line with Manconi, Massa, and Yasuda (2012). Concentration is measured primarily by the share of bonds held by the largest 5 funds, but key results are robust to other definitions, such as the share held by the largest 10 funds, the share held by all mutual funds, and the Herfindahl index among mutual fund investors. All explanatory variables are measured as of 2008:Q2 or 2013:Q1 to control for possible endogeneity. Outliers in observed market price data were reduced by winsorizing the 5 percent tail of the respective distributions.

Relationship between a fund's liquidity risk and its management

The main mutual fund and ETF data source is the CRSP survivor-bias-free database covering publicly offered open-end mutual funds domiciled in the United States. Even though CRSP's data cover only U.S.-domiciled funds, CRSP provides more details on funds' fee structures and assets, including quarterly security-level holdings, than other global fund databases such as EPFR Global or Lipper for Investment Management. These global data are used for some additional robustness tests or for extending some analysis to funds domiciled outside the United States.

Data are cleaned for outliers. In line with Coval and Stafford (2007); Jotikasthira, Lundblad, and Ramadorai (2012); and Jinjarak and Zheng (2014), the data are excluded if they meet the following conditions: (1) monthly returns are higher than 200 percent or lower than –50 percent; (2) monthly change in total net assets (TNA) is higher than 200 percent or lower than –100 percent; or (3) fund TNA is less than US$5 million. In addition, for cash balance analysis, portfolio allocation weight data by broad asset types are discarded if the sum of allocation weights is less than 95 percent or greater than 105 percent. Weights may have a negative value because of derivatives and securities held in short positions. Outliers are removed by discarding data when any single weight takes a value of less than –100 percent.

The roles of portfolio managers and end investors

Following Raddatz and Schmukler (2012), a fund's net investment in a security is divided into fund flows from end investors and the contribution of the changes of portfolio weights to the security, determined by portfolio managers. The term F_j is the total investment in security j (net of valuation effects) from all funds i in the sample. This investment is divided into

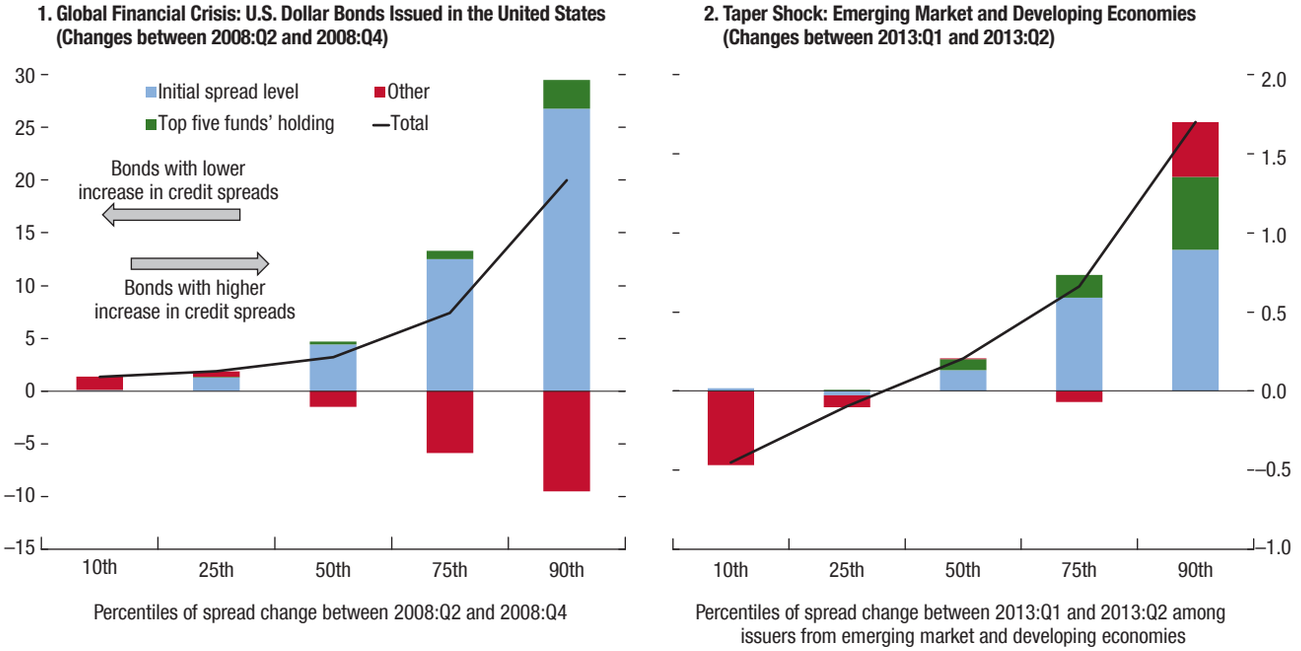
$$F_j = \sum_i \frac{Fund\ i's\ holding\ of\ asset\ j}{Total\ asset\ j\ held\ by\ all\ funds\ in\ sample} \times \Delta w_{ij} + \sum_i \frac{Fund\ i's\ holding\ of\ asset\ j}{Total\ asset\ j\ held\ by\ all\ funds\ in\ sample} \times Fund\ flows\ to\ i \quad (3.6)$$

In the equation, Δw_{ij} is the change in portfolio weight of fund i to asset j, net of valuation effects. The first term of the equation represents manager's choice and

Annex Figure 3.2.1. Drivers of Changes in Credit Spreads during Stress Episodes
(Changes in credit spreads in percentage points, by the levels of the spread changes)

During the global financial crisis, bonds that were held in a more concentrated manner were adversely affected, especially those with high initial spread levels.

The same was true for emerging market and developing economy bonds during the "taper shock" episode.



Sources: eMaxx; and IMF staff estimates.

the second represents end investor's choice. Then, the variance of F_j is calculated as the sum of each component's variation. This variance is estimated on a quarterly basis for all funds covered in the CRSP database for the period 2005:Q1–2014:Q4, excluding securities held by fewer than five funds.

Fund flows analysis

This analysis studies the drivers of monthly net flows for U.S. mutual funds and ETFs at the funds' share-class level for open-end bond and equity funds, covering the period 1998–2014.[49] Explanatory variables include fund performance and benchmark performance, the VIX, and various fund characteristics (size, age, clientele, purchase and redemption fees, fund types, and the liquidity of the underlying asset classes). The list of variables used in the analysis is explained in Annex Table 3.2.1. The following model (for share class i, month t, and benchmark j) is estimated with share-class fixed effects and year fixed effects as in Chen, Goldstein, and Jiang (2010), and using robust standard errors. An analogous specification was run including the interaction terms with benchmark performance instead of excess return over benchmark.

$$\begin{aligned} \textit{Fund flows}_{it} = {} & \beta_0\, \textit{Benchmark Performance}_{jt-1} \\ & + \beta_1\, \textit{Performance}_{it-1} + \beta_2 \textit{VIX}_t \\ & + \beta_3\, \textit{HIGH\_VIXD}_t + \beta_4 \textit{VIX}_t \\ & \times \textit{HIGH\_VIXD}_t \\ & + \lambda \textit{Fund Characteristics}_i \\ & + \delta \textit{Performance}_{it-1} \\ & \times \textit{Fund Characteristics}_i \end{aligned} \tag{3.7}$$

The test for convexity in the flow-performance relationship follows a piecewise-linear specification as in Sirri and Tufano (1998) and Ferreira and others (2012). This approach measures different linear slopes for the lowest

[49]A fund may issue several classes of shares. The only difference across share classes is fees. "Fund's TNA" means the sum of TNA of each share class issued by the fund.

20th, middle 60th, and top 20th percentiles of performance. Each month, funds are ranked according to their performance, ranging from zero (poorest performance) to one (best performance). The following model is estimated,

$$\begin{aligned} Fund\ flows_{it} = {} & \beta_0\ Benchmark\ Performance_{jt-1} \\ & + \beta_1 VIX_t + \beta_2 HIGH\_VIXD_t \\ & + \beta_3 VIX_t \times HIGH\_VIXD_t \\ & + \lambda Fund\ Characteristics_i \\ & + \delta_1 Low_{i,t-1} + \delta_2 Mid_{i,t-1} \\ & + \delta_3 High_{i,t-1}, \end{aligned} \tag{3.8}$$

in which the three levels of relative performance are defined as follows:

$$Low_{i,t-1} = min\{0.2,\ Rank_{i,t-1}\}$$

$$Mid_{i,t-1} = min\{0.6,\ Rank_{i,t-1} - Low_{i,t-1}\}$$

$$High_{i,t-1} = Rank_{i,t-1} - (Low_{i,t-1} + Mid_{i,t-1}) \quad Rank \in [0,1]$$

Analysis of redemption fees in times of stress

This analysis examines the role of redemption fees during times of stress. It covers two stress events: the 2008 global financial crisis and the taper episode in 2013. We compute the difference between average flows before the crisis periods (May to August 2008 and December 2012 to April 2013) and average flows during the stress periods (September to December 2008 and May to September 2013) for funds with high and low redemption fees. Funds are classified as having low redemption fees if redemption fees are equal to zero. Funds are classified as having high redemption fees if redemption fees are greater than or equal to 0.03 percent in 2008 and 0.01 percent in 2013.[50] Flows are standardized by the beginning-of-period TNA. For 2008, the focus is on equity funds because there is evidence of flight to quality into bond funds. For 2013, the focus is on emerging market equity and bond funds.

Cash holdings analysis

Drivers of fund cash holdings are investigated by estimating the model in equation (3.9). For share class *i* and quarter *t,* the model is estimated with a pooled panel regression at the share-class level, including year fixed effects and using robust standard errors. Because the cash balance shows a U-shaped pattern with respect to fund flows (Figure 3.12), the model estimates a different coefficient for funds with large outflows (fund flows below $\delta = -1.5$ percent of TNA).[51]

$$\begin{aligned} Cash_{it} = {} & \beta_1 Flow\ volatility_{it} + \beta_2 Fund\ flow_{it} \\ & + \beta_3 I(Fund\ flow_{it} < \delta) + \beta_4 Fund\ flow_{it} \\ & \times I(Fund\ flow_{it} < \delta) \\ & + \lambda Fund\ Characteristics_i \end{aligned} \tag{3.9}$$

Brand name effect analysis

"Flagship shocks for large AMCs" are identified as follows: First, a "shock" happens when a fund's flow-to-TNA ratio is below the median of its peer group (those with the same Lipper investment objective code) by 10 percentage points or more. Second, a fund with a "shock" is identified as "flagship" when its TNA is the largest of the funds administered by the same AMC (a fund family) at the end of the month before the shock. Third, the flagship shock corresponds to a large AMC if the flagship fund's asset manager was among the top 25 as measured by end-year TNA for the shock year or any of the previous four years.

There are "brand name effects" if, in the three months including and after the flagship shock (*s*, *s*+1, *s*+2; where *s* is the event month), funds in the same family receive significantly lower inflows relative to comparator funds outside the family.[52] For each event (period *s*), a separate cross-sectional regression model is estimated for the difference between the cumulative net inflows to each fund *i* between dates *s* and *s*+2 and the median cumulative net inflows for funds with the same investment objective *j*. Explanatory variables are lagged excess return, age, and a flagship family dummy.

$$\begin{aligned} & Cumulative\ Fund\ flow_{ij\_\{s,s+2\}} \\ & \quad - Median(CumulativeFund\ flow_{j\_\{s,s+2\}}) \\ & \quad = \beta_1 Performance_{is-1} + \beta_2 Age_{it} \\ & \quad + \beta_3 Family\ Dummy(i \in I^s) \\ & \quad for\ all\ events\ s\ and\ for\ all\ funds\ i\ with \\ & \quad investment\ objective\ j \end{aligned} \tag{3.10}$$

[50]The 2013 analysis studies emerging market funds, and therefore yields very few observations when using the 0.03 threshold.

[51]The cash holdings empirical analysis excludes sectoral, hedged, and short equity funds.

[52]Some of the identified flagship events overlap. Overlapping cases are treated as a single event and the family dummy is set to 1 if a share class belongs to either of the affected flagships' families.

I^s identifies the funds (at share-class level) that are managed by the same AMC that manages the "shocked" flagship fund (excluding the flagship itself).

Systemic risk

Systemic risk is measured for the system of mutual funds, banks, and insurance companies from advanced economies.

- Mutual funds' NAV and total net asset data are from Lipper. For each of the three fund domicile areas (the United States, Europe, and other advanced economies) and the five asset classes (advanced economy equities, advanced economy sovereign bonds, advanced economy corporate bonds, emerging market equities, and emerging market bonds), a sample consisting of the top 100 funds, measured by total net assets, was selected, resulting in 1,500 funds. Data covering January 2000 to November 2014 were cleaned by dropping funds with fewer than 10 observations and excluding observations with weekly NAV returns of less than –60 percent or greater than 80 percent.
- For the banking and insurance sectors, weekly returns are computed using Thomson Reuters equity indices for European and U.S. banks and insurance companies.
- The system's return is computed as the average of funds, banks, and insurance returns weighted by their relative asset size. Data on total assets of banks, insurance companies, and mutual funds are from quarterly flow-of-funds data for the United States and the euro area. An alternative measure using a simple average was also used, yielding similar results.

Systemic risk is estimated following the static CoVaR approach put forward by Adrian and Brunnermeier (2011), using quantile regressions. First, the returns of the system are regressed on the returns of each individual institution i when that institution has the lowest 5th percentile returns:

$$R_t^{System,i} = \alpha_i + \beta_i R_t^i + \varepsilon_{it}. \tag{3.11}$$

Then, CoVaR is computed as the VaR of the system conditional on institution i being in distress (defined as when its return R^i is below its 5 percent VaR, $-VaR^i_{5\%}$):

$$CoVaR_i = \hat{\alpha}_i + \hat{\beta}_i R^i = \hat{\alpha}_i - \hat{\beta}_i VaR^i_{5\%}. \tag{3.12}$$

The contribution to systemic risk of an institution i is computed as the difference between the $CoVaR_i$ when institution i is in distress and the $CoVaR_i$ when institution i has median return ($\Delta CoVaR_i$):

$$\begin{aligned}\Delta CoVaR_i &= CoVaR^i_{5\%} - CoVaR^i_{50\%} \\ &= -\hat{\beta}_i(VaR^i_{5\%} - VaR^i_{50\%}).\end{aligned} \tag{3.13}$$

The relationship between fund size and its contribution to systemic risk is examined with the following cross-section regression model:

$$\begin{aligned}\Delta CoVaR_{ij} = Constant_j + \alpha VaR_i + \gamma Logsize_i \\ + \delta Return_i + \varepsilon_i.\end{aligned} \tag{3.14}$$

The model controls for asset class (j) specific fixed effects and fund i's risk (VaR) and return (average in the sample period). Fund size is the log of average size in U.S. dollars over the sample period. Fixed effects are positive and significant for advanced economy equities and emerging market equities and bonds, negative for advanced economy sovereign bonds, and not significant for advanced economy corporate bonds. All the other coefficients for control variables are significant and positive at the 5 percent level. The coefficient for size is positive and significant at the 10 percent level. Alternative regressions that allow the parameters on VaR, size, and returns to vary by asset class show qualitatively similar results.

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