

Money Market Funds, Bank Runs and the First-Mover Advantage

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Abstract

Several recent reports from regulatory bodies have recommended that money market funds should be required to move from stable to variable net asset valuation pricing, to reduce the risk of first-mover advantage and the risk of a run on the fund. Most money market fund sponsors doubt that this proposal will reduce either run risk or first-mover advantage.

Thirty years of academic research on bank runs has concluded that the best protections against bank runs are retail deposit insurance or the suspension of convertibility. There are no arguments within the academic literature in favour of changing the terms of the demand deposit contract, from stable to variable value: it is quite remarkable that the preferred solution for MMFs is one without precedent in banking regulation.

Money market funds are different from banks in four fundamental respects. These differences concern their legal form but also, importantly, their economic function. Money market funds do not engage in fractional reserve banking and they do not perform liquidity creation. Money market funds, like other capital markets products, are vulnerable to the unanticipated actions of investors during periods of market distress. At such moments there is a risk that money market funds might contribute to the amplification of systemic risk.

In a period of heightened systemic risk, the ability of money market funds to suspend the standard terms under which shareholders are able to redeem fund units for cash, is the mechanism most likely to eradicate the possibility of a first mover advantage and thereby to reduce the risk of a run. In the absence of a credible deposit insurance policy for the money market fund industry, suspension of convertibility should be the preferred option: for regulators, for fund sponsors and for investors.

Keywords: Money market funds, bank runs, first mover advantage

JEL: G15, G18, G21, G23.

Money Market Funds, Bank Runs and the First-Mover Advantage

Introduction

The Final Report of The Board of the International Organization of Securities Commissions, entitled "Policy Recommendations for Money Market Funds" (October 2012) states that one of the residual vulnerabilities of money market funds (MMFs) that could have broader consequences for the financial system is the so-called "first-mover advantage":

... where investors have an incentive to redeem from a troubled MMF or at the first sign of market distress, since investors who redeem shares early will redeem on the basis of the stable NAV leaving the cost of any loss to be borne by the remaining shareholders. Such advantage is also present, albeit less prominent, in variable NAV funds, as managers may sell more liquid assets first, shifting the risks of selling less-liquid assets to remaining shareholders. (IOSCO, 2012)

Concerns about run risk and the first-mover advantage within the MMF sector are, taken together, identified as the specific grounds for Recommendation 10 in the IOSCO Report, namely that regulators require MMFs to convert from stable to variable net asset value (NAV) or to introduce a range of alternative structural safeguards to mitigate these risks. (IOSCO, 2012, p.15-16).

Subsequently, further reports published in November 2012 by the US Financial Stability Oversight Council ("Proposed Recommendations Regarding Money Market Mutual Fund Reform") and by the Basel based Financial Stability Board ("Strengthening Oversight and Regulation of Shadow Banking Entities") have made similar claims about the vulnerability of MMF¹ to run risk, and have made similar proposals to reform the structure of MMFs (FSOC, 2012 and FSB, 2012).

The argument upon which Recommendation 10 is based - namely that run risk in MMFs is connected to the pricing structure of the fund and therefore that stable NAV MMFs are more vulnerable to run risk than variable NAV MMFs - is regarded with considerable scepticism within the industry. Most sponsors of MMFs doubt that conversion from stable to variable NAV will reduce either run risk or first-mover advantage.

¹ The debate about the vulnerability of MMFs to run risk has not been helped by a lack of a clearly defined and commonly accepted meaning of the term "money market fund". In this paper we adopt the definition proposed by IOSCO in an earlier paper: "an investment fund that has the objective to provide investors with preservation of capital and daily liquidity, and that seeks to achieve that objective by investing in a diversified portfolio of high-quality, low duration fixed-income instruments." The term MMF should therefore be taken to include both variable and stable NAV funds unless otherwise specified in the text.

The concept of the "first-mover advantage" was originally developed in the business management literature to describe a variety of mechanisms that confer advantages on firms that are first to exploit an initial asymmetry among competitors in a particular sector (Lieberman & Montgomery, 1988). There is continuing debate as to how such mechanisms work and the extent to which first-mover advantages are predictable *ex ante* rather than merely observable *ex post*. In some cases it is clear the first-mover suffers a disadvantage.

In the literature on bank runs, however, it is always assumed that there is an advantage to investors of moving early rather than late: early withdrawals take place at par whereas later withdrawals might do so, depending on the ability of the bank to remain liquid; but they might not take place at all, if the bank runs out of funds, at which point the value of a demand deposit falls to zero (or thereabouts). In the standard account of a bank run the first-mover will always be at least equally advantaged compared with the last-mover, and might be very significantly advantaged.

The questions this paper addresses are, What can be done to reduce the risk of bank runs and to limit the first-mover advantage for bank deposit holders? And, by analogy, what can be done to reduce the risk of runs in MMFs and to limit the first-mover advantage for MMF shareholders? Based on an assessment of recent academic research on bank runs the answer would seem to be that, in the absence of a government-funded insurance scheme for MMF shareholders, and lacking direct access to central bank liquidity support, the optimal regulatory solution should be based around the suspension of convertibility. In a period of market distress and heightened systemic risk, the ability of MMFs to suspend the standard terms under which shareholders are able to redeem shares for cash, is the mechanism most likely to eradicate the possibility of a first-mover advantage and thereby to reduce the risk of a run.

Explaining Bank Runs

Understanding the causes of bank runs and finding ways to prevent them or to mitigate their effects has long been a pre-occupation of economists and policy makers (see, for example, Bagehot, 1873 and Sprague, 1908), not least because bank runs have been a recurring feature of modern economic life. In the US, the establishment of the Federal Reserve System (FRS) in 1913 and the establishment of the Federal Deposit Insurance Company (FDIC) in 1933 - were policy responses to bank runs (in 1907 and 1933). The FRS was empowered to provide additional funds for banks through its discount window, as the lender of last resort, and the FDIC provided insurance protection for retail depositors (Friedman & Schwartz, 1963; Calomiris, 1990).

The standard model for analysing the causes of a bank run and, consequently, assessing the likely success of both preventative and remedial measures, is that published in the *Journal of*

Political Economy by Douglas Diamond and Philip Dybvig in 1983. They propose a simplified, formal model to explain both why banks are able to attract depositors and why these depositors might, in certain circumstances, run from the bank.

Diamond and Dybvig start by setting out the social and economic benefits of the banking system: the transformation of illiquid assets into liquid liabilities. This transformation can be achieved by the use of demand deposit contracts between the bank and its depositors. Under one equilibrium, in which depositors maintain confidence in the bank, efficient risk sharing is achieved and social and economic benefits are secured. Under an alternative equilibrium, confidence is not maintained and a bank run ensues, as depositors rush to redeem their deposits. In this equilibrium they are rational to rush because banks operate under a sequential service constraint, meaning that the payoff to each depositor depends solely on the place of that depositor in the queue. If the bank run continues, first the liquid and then the illiquid assets are sold, most likely at below their long term value, leading to capital losses for the depositors towards the end of the queue. The wider economy suffers from a loss of production and a consequent decline in social welfare. The question Diamond and Dybvig pose is, What can be done to enhance the deposit contract such that the risk of a bank run is reduced and an optimal equilibrium state of risk sharing is achieved?

One possible solution is the suspension of convertibility: if withdrawal requests are too numerous, the bank might put a stop to the conversion of the deposit contract into cash. The threat of suspension is shown to be successful in lowering the risk of bank runs *ex ante*; however, if a run does take place then, *ex post* suspension can be both socially inefficient and unpopular. Another possible solution is the provision of deposit insurance, guaranteeing that the full value of the deposit will be paid to all who wish to withdraw. While such insurance might be offered by a private company, the scale of the unconditional guarantee required for deposit insurance to be both comprehensive and credible suggests that the government should underwrite the insurance cover, paid for by an increase in tax revenues. Diamond and Dybvig argue that government deposit insurance provides the best protection against bank runs, allowing banks to manage asset liquidation policies in an optimal manner, thereby increasing economic and social welfare. If the promise to provide insurance is credible the promise will never need to be fulfilled because bank runs will not occur: a costless Pareto-improved equilibrium will therefore be secured (Diamond & Dybvig, 1983).

In a subsequent article Diamond and Dybvig discuss the moral hazard problem associated with the provision of fixed rate deposit insurance by, for example, the FDIC:

... it is well known that the bank may have an incentive to select very risky assets since the deposit insurers bear the brunt of the downside risk but the bank owners get the benefit of the upside risk. Since fixed-rate insurance is necessarily underpriced for banks taking large enough risks, banks can have an incentive to pay above-market rates of return to attract large quantities of deposits to scale up their investment in risky assets. If there were no regulation,

much of the risk in the entire economy would be transferred to the government via deposit insurance. (Diamond & Dybvig, 1986, p. 59).

Moreover, the presence of deposit insurance relieves depositors of the burden of monitoring the risk profile of the bank with which they make deposit contracts. If deposit insurance is comprehensive, it aligns the interests of depositors and bank managers: both sets of agents have an incentive for the bank to acquire a portfolio of high-risk assets, increasing the probability that bank profits and bank deposit rates are higher. The downside risks are covered by taxpayers' money. For example, the Savings & Loans crisis in the US, during the 1980s, saw transfers in the order of \$130bn from taxpayers to bank depositors (Cooper & Ross, 2002).

Various proposals have been made to design deposit insurance in such a way that the moral hazard problem is reduced to acceptable levels. One proposal would be to replace fixed-rate deposit insurance with a risk-adjusted rate, such that banks undertaking more risky activities are forced to pay higher premiums, set by regulators who have privileged access to the bank's loan book. Monitoring bank risk is a difficult and imprecise art, so rather than tailor the level of the premium to the risk profile of each bank another idea would be to disallow banks that benefit from deposit insurance from engaging in certain high risk lending practices. Once again, the difficulty for the policy maker is knowing *ex ante* the precise risk profile associated with a certain type of lending activity. If there is a clear social and economic benefit from the liquidity transformation that banks achieve, then any constraint of this activity has a social cost: if the financial fragility of banks is beneficial, then we should be careful not to constrain this fragility unduly (Diamond & Rajan, 2001).

Other proposals to deal with the question of moral hazard include banks holding additional capital to fund the first loss on any defaults (Cooper & Ross, 2002); the introduction of contingent demand contracts for depositors, which limit the amount that they could withdraw from the bank according to the current volume of other depositors also seeking to withdraw funds (Postlewaite & Vives, 1987); the abandonment of fractional-reserve banking and a requirement that banks hold Treasury securities equivalent in value to 100% of customer deposits (Kareken, 1986); and limiting the coverage of government deposit insurance to, say, 90% of the deposit and encouraging depositors to self-insure the residual 10% (McCulloch, 1986).²

Academics have also considered the problem of bank runs in a different way. Rather than looking at the policies that make bank runs less likely, and the impact these policies might be expected to have on agents' incentives, they have considered what might be done to mitigate the damage caused by a bank run once it has started. Examples include the use of

² At the time of the run on Northern Rock Bank in the UK in September 2007, UK bank deposits were fully insured up to £2,000 with additional insurance of 90% of the value of the deposit, up to a ceiling of £35,000.

time inconsistent policies such as the replacement of an *ex ante* "tough" stance on the wholesale suspension of convertibility with an *ex post* "moderate" policy of partial convertibility (Ennis & Keister, 2009); and giving regard to the wider institutional structure of the economy and in particular the strength of the contracting environment (Demirgüç-Kunt & Kane, 2002).

Another problem concerns the appropriate policy response to a run on a financial market rather than a specific financial institution, that is a run on the banking sector rather than a run on a particular bank. One recommendation is the assurance of provision of sufficient liquidity for the market as a whole by the government, equivalent to the US government's strategic petroleum reserves held in the Gulf of Mexico, which are rarely released, but whose presence is itself thought to reduce the risk of a run on petrol supplies (Bernardo & Welch, 2004). Related to this question is the need to distinguish between the case when a bank run is based on a lack of information - the depositors do not know the true nature of the bank's assets, but run from the bank because of the first mover advantage - and the case when a bank run is based on the presence of good information - the depositors do know the true nature of the bank's assets, and run from the bank for that very reason:

... what our finding suggests is that bad prospects for the banking system as a whole do not necessarily lead to a flow of funds out of the system in the absence of alternative stores of value. In a multibank system in which there may be bad news about individual banks in an economy with other inter-temporal markets, information-based runs will obviously exist regardless of the risk aversion of depositors. (Jacklin & Bhattacharya, 1988, p588.)

In other words, the question of bank runs should not be considered in isolation from the question of what else depositors might do with their cash: what do they switch into when the switch out of bank deposits?

The risk of runs on MMFs

Having reviewed the academic literature on the causes of bank runs and what might be done to prevent or mitigate them, we now turn to the question of what might cause runs in MMFs and what might be done to prevent or mitigate them. To address this question requires four steps: first, a brief comparison between banks and MMFs to make clear their similarities and differences; second, a review of the reasons why MMFs might be subject to runs and what the consequences might be for the wider financial system; third, a recognition of the beneficial role that MMFs play in the money markets, in particular by making the banking system less risky; finally, a discussion of three possible policy responses and the likelihood that they might reduce the risk and the impact of runs on MMFs.

a) Banks and MMFs: a comparison

Banks, as Diamond and Dybvig argued, are companies that create liquidity by converting illiquid loans into liquid deposits. In the absence of a banking system, loans to businesses would be made directly by owners of capital, whose investment would reflect the character of the business, i.e. many of the loans would be long-term and illiquid. When a bank intermediates this process, using its balance sheet to fund the loans by gathering deposits, the loans remain illiquid but the deposits are available on demand. The bank has created liquidity: it is this activity that is the source both of the economic value and the fragility of the banking system. By contrast MMFs do not create liquidity in this sense; rather, they manage their investors' extant liquidity. MMFs convert short-dated, high credit quality and highly liquid loans into liquid equity. There is a modest maturity transformation and a modest liquidity transformation in a MMF, but these are immaterial when compared with the activities of banks. The basic question that Diamond and Dybvig ask - how is it possible to achieve a Pareto optimal equilibrium in the deposit contract between the depositor and the bank? - does not arise for a MMF, because the MMF is not creating liquidity for the investor (Diamond & Dybvig, 1983 and 1986).

Second, while the demand deposit contract that characterises bank activity is standard and has existed in the same form for many years (Postlewaite & Vives, 1987) the contract between an investor in a MMF and the sponsor of the MMF is different. First, it is an equity contract not a deposit contract: the investor buys shares in a mutual fund rather than depositing cash with a bank. Second, the contract is a contingent demand contract: MMF sponsors seek to preserve capital, to provide liquidity, and to offer a return on investment in line with money market rates, but none of these is guaranteed in the contract. The MMF sponsor might be unable to re-pay the capital in full, might be unable to provide liquidity on demand, and might fail to offer a return that was in line with money market rates. These failures might damage the business reputation of the MMF sponsor but they are not breaches of contract.

Third, it is characteristic of banks that information on the quality and riskiness of their assets is not publicly available; indeed this information is hard to ascertain even for well-informed financial observers, which is why risk-adjusted deposit insurance premiums would be difficult to introduce in practice, notwithstanding their theoretical appeal (Diamond & Dybvig, 1986). By contrast, information on the assets of a MMF is readily available: there are clearly defined regulations that stipulate what sort of assets may be owned in the fund, and MMF sponsors provide lists of asset holdings to regulators.³ Whereas the risk profile of a bank is obscure to its depositors, the risk profile of a MMF is transparent to its shareholders.

³ In the US, new disclosure standards require that a MMF report details every month on every security it holds, every piece of collateral backing repurchase agreements, its mark-to-market NAV, and a wide range of other salient information. In Europe such information is also made available to regulators and, frequently, to investors too.

This difference is important, as we will see later, because it means that fund-specific, risk-adjusted contingency measures are possible for MMFs in a way that is not possible for banks.

Fourth, modern banks use a fractional reserve model, which means that the size of their capital reserves (usually a mix of equity and debt) is much smaller than the size of their portfolio of loans, the balance being comprised of deposit liabilities. By contrast, the capital structure of MMFs is comparable to a "narrow bank", that is a bank that holds reserves equal to 100% of its loans. This importance of this point is emphasised by Diamond and Dybvig:

Existing open-ended mutual funds (and especially money market funds) are essentially 100% reserve banks. They issue readily cashable liquid claims, but, unlike existing banks, they hold liquid assets, as would 100% reserve banks. The mutual fund claims are cashable at a well-defined net asset value. They provide the "law of large numbers" service and to some extent they provide transaction clearing services. Given the success and stability of mutual funds, it is tempting to conclude incorrectly that they would be a good substitute for banks. Of course, this incorrect conclusion ignores the value of the transformation services (creation of liquidity) provided by banks. (Diamond & Dybig, 1986, p.65).

The reason why MMFs have a different capital structure to banks is because they perform different tasks. MMFs provide their investors with an aggregation service and professional credit risk management, but they do not perform the liquidity or maturity transformation services that make banks so important to the wider economy.

The similarities between MMFs and banks are, therefore, essentially superficial. It is important to emphasise the substantive differences between MMFs and banks because the authors of the FSB report argue that economic functions matter more than legal form:

[The economic function-based perspective] ... allows the extent of non-bank financial entities' involvement in shadow banking to be judged by looking through to their underlying *economic functions* rather than *legal names or forms*. (FSB, 2012, p8).

However, first it is quite clear from the academic literature that when we consider the economic functions of MMFs these are plainly not the same as banks: MMFs do not engage in liquidity creation and they do not engage in fractional reserve banking activities. Second, as will become clear later in the paper, the difference in legal form between banks and MMFs is important since it provides MMFs with strategies to mitigate run risk that are not available to deposit taking banks: the contract MMFs offer is a contingent equity contract and their asset holdings are transparent and low risk. In other words, when markets are in distress and systemic risk is rising, the legal form of a financial entity matters a great deal.

b) Risks associated with MMFs

For many years MMF sponsors have been criticised for using the "penny rounding" pricing technique to value their MMFs at a stable NAV of 1.00 (for example, McCulloch, 1986, p80, fn.1). It is claimed that the fund's price should reflect the real value of the assets in the fund and that even when the real value is only marginally different from the 1.00 stable price, a variable price would better reflect economic reality.⁴ More recently, it has been claimed that by using a pricing structure similar to insured deposit contracts MMFs trade on an implicit promise that the equity contract is insured in the same way that a bank deposit is insured: the backstop support for the MMF industry, provided by the US government in September 2008, made explicit this promise at tax-payers' expense (Gorton & Metrick, 2010).

These criticisms of stable NAV pricing link the pricing structure with the vulnerability of MMFs to run risks. The argument - which, as we saw earlier, now informs IOSCO's proposals for reform of the MMF sector - assumes that investors believe that MMF shares are just like insured bank deposits; and for all the same reasons that in a time of market distress investors might run from a bank, so MMF investors might have reason to run from a MMF. In this scenario the first-movers - the investors who get to the front of the queue to withdraw their cash - are more likely to be repaid in full, and so are advantaged.

There are several problems with this argument. First, the "penny rounding" price structure has been used for many years because it accurately reflects the fact that there is very little price volatility in the value of the assets held by MMFs in normal circumstances. The majority of assets held in MMFs are not traded; they are bought and then held to maturity. Further, for many of these assets there are not active two-way markets from which realistic mark-to-market prices could be obtained, so amortised-cost accounting is used because it provides the most accurate measure of the asset's value. From an accounting point of view the stable NAV pricing policy is appropriate given the sorts of assets held in MMFs: it is a true and fair pricing policy.

Second, what makes MMFs attractive to institutional investors is not an implicit guarantee or promise that MMF shares will always be redeemed at 1.00 and that the investor's capital is protected by insurance (or underwritten by the taxpayer); it is, rather, that MMFs are convenient as a way of managing short-term cash holdings. By aggregating cash holdings across a wide range of investors, MMFs provide economies of scale which many investors (both retail and institutional) are not able easily to secure for themselves, in particular the provision of professional credit risk analysis.

Third, the argument that MMFs benefit from being seen as "insured demand deposits in disguise" fails to explain the attraction of MMFs to institutional investors, who currently

⁴ In both the US and Europe, MMFs that use stable NAV pricing are obliged to move to a market price only if the Fund value falls below 99.50 (or, rises above 100.50).

represent around three-quarters of all MMF shareholdings worldwide (FSOC, 2012, p.21). The size of the cash holdings of institutional investors is such that only a small fraction of their holdings would be eligible for deposit insurance were they to make use of demand deposits provided by banks instead of MMFs.⁵ While for retail investors, using a MMF means giving up deposit insurance for other benefits, such as a higher return, for institutional investors there is no meaningful deposit insurance benefit to be given up, because it is not available to them from either demand deposits or MMFs.

Finally, it is simply not clear that the reason investors withdrew cash from MMFs in September 2008 was connected in any way to their stable NAV pricing structure. Nor is it clear that the withdrawals should be characterised as a run, in the classic sense of the term. This point is made by Andrei Shleifer, in his comments on the Gorton & Metrick paper:

Following Douglas Diamond and Philip Dybvig (1983), economists often use the term "run" to describe a multiple-equilibrium situation, in which a bad equilibrium with a run can occur despite solid fundamentals. Such a run does not seem to be a good description of what happened to Lehman and other banks in 2008. The withdrawal of short-term finance surely undermined bank balance sheets, but it seems to me at least as plausible that this withdrawal was a response to an already incurable situation rather than its cause. And if that is the case, regulating short-term finance might not be as high a priority as Gorton and Metrick indicate. (Gorton & Metrick, 2010, p.300).

Data on redemptions from MMFs during the autumn of 2008 supports Shleifer 's argument. First, while there were significant withdrawals from prime MMFs, which own a mix of bank and government debt, at the same time there were large inflows into government MMFs, which own only government debt (McCabe, 2010). This suggests that there was a widespread asset allocation shift, as investors moved out of bank and into government credit in response to the evident and systemic problems in the banking sector: less of a run, more of an information-based asset allocation (Jacklin & Bhattacharya, 1988). The data also suggests that most of those who withdrew assets from MMFs during this period were institutional investors not retail investors (McCabe, 2010). In other words, these were not investors who ran from MMFs to banks because they realised that they lacked deposit insurance and decided they wanted it; rather, these were investors who were ineligible for deposit insurance and who switched to government credit to reduce their investment risk.

A second, more persuasive account of the risks associated with MMFs draws on the ideas of an "amplifying mechanism" and a "loss spiral" (Brunnermeier, 2009). When a financial market is shocked, or enters a period of distress, there is often a fall in the price of assets, which leads to a withdrawal of liquidity, which in turn amplifies the risks and depresses prices further. Many market participants make use of assets as collateral, whether in repo transactions or for margin calls. As asset prices fall and margin calls and repo haircuts

⁵ The \$100,000 limit on deposit insurance in the US was raised to \$250,000 in 2008 (initially as a temporary measure, but later on a permanent basis). Limits in Europe are of similar size.

increase, so too there are sharp falls in the availability of funding liquidity. Consequently, banks and brokers respond by deleveraging to reduce the funding requirement for their positions. If many market participants seek to sell assets for cash concurrently this creates further downward pressure on prices, which in turn causes a further increase in margin calls and haircuts. What follows is a spiral of losses, as each write-down of asset prices leads to a further round of deleveraging.

This looks to be a much more promising analysis of what happened in financial markets in 2008 and provides a clearer explanation of why liquidity dried up in many markets, including the market for the kinds of short-term assets held by MMFs. It would also help to explain why the pressures on asset prices and the impact of deleveraging varied market by market, and currency by currency, with the US dollar market experiencing significantly greater pressures than the Euro and Sterling markets. When investors started to sell shares in MMFs, managers sought to restore the natural liquidity of their MMFs by selling assets. The secondary market for assets was already overwhelmed by sales of similar assets by banks and brokers, seeking to lower their risk exposure and to reduce the cost of funding their residual asset positions. MMF managers that sought to sell into falling markets consequently risked crystallised losses for their shareholders; at the same time their actions risked amplifying the existing downward pressure on asset prices.

In summary, the standard criticism of MMFs that the pricing structure misleads investors into thinking that they have an implicitly insured deposit (or equivalent) turns out to be highly implausible. First, according to the Diamond and Dybvig model, if investors really believed that their MMF share was insured they would not need to run. Second, most of the investors who moved from prime to government MMFs were institutional investors for whom deposit insurance is irrelevant; they did not run from MMFs, they switched from bank credit to government credit within a MMF structure. Third, the real systemic concern about MMFs is that, at times of market distress, their ability to create liquidity by selling assets is compromised by the loss spiral that is already taking place in asset markets; and if they succeed in selling, they also (unintentionally) amplify the level of market distress.

c) Benefits of MMFs

MMF sponsors have marketing teams that can provide long lists of the benefits of MMFs for their investors. In this paper we are more interested in the benefits that MMFs bring to the wider financial system, through lowering the overall risk profile of the banking system. These are benefits that regulators should be interested in preserving.

The first benefit accrues from considering the effect that MMFs have on the retail deposit market, by providing an investment choice to retail investors. McCulloch describes a period, in early 1983, when MMFs in the US lost around 25% of their assets. Retail investors

had previously been able to choose between insured demand deposits, on which the payment of interest was prohibited owing to Regulation Q, and MMFs, which paid interest but lacked deposit insurance. In 1983 a number of banks and thrifts introduced a new Money Market Deposit Account (MMDA) which paid some interest but was also covered by deposit insurance. As McCulloch notes:

Although MMDAs are even safer than MMFs from the depositors' point of view, they are much riskier from the point of view of the economy as a whole since they may be used to finance loans of very long maturity, very low quality, or very high default risk. (McCulloch, 1986, p.80, fn2).

In other words, if retail depositors invest the majority of their cash in insured bank deposits then the size of the moral hazard problem grows, as does the problem of the largest banks being perceived as "too big to fail". However, if retail depositors move some or all of their cash to MMFs, then the size of the liability to be covered by deposit insurance (and underwritten by taxpayers) reduces.

One of the arguments against providing deposit insurance for institutional investors is the huge size of the potential liability; the second argument is that institutional investors, such as banks and MMFs, provide a useful service in monitoring the riskiness of the activities of the banks to whom they lend (Demirgüç-Kunt & Kane, 2002). The difficulties of well-informed judgements concerning the risk profile of a bank's loan portfolio was mentioned earlier, as a reason why the introduction of risk-adjusted deposit insurance premiums would be problematic. Banks need to raise deposits to fund their lending activities: if a bank is unable to secure sufficient funds from retail investors (who are insured and have little incentive to worry about the risk profile of the bank's loans) then it must rely on other banks or MMFs who will require more and better disclosure about the risk profile of the borrowing bank's loans. The proprietary credit research that institutional investors undertake to inform their investment decisions acts as a deterrent to banks when it comes to risk-taking: bank's that take higher risks will have to pay more for deposits.

Third, as has been noted, around two thirds of assets in MMFs are now held on behalf of institutional rather than retail investors. In recent years there has been significant growth in the size of the pools of institutional assets held in highly rated and highly liquid instruments (Pozsar, 2011). The investors' primary concern is to achieve security and liquidity for their asset holdings and, in many cases, they make use of MMFs as an alternative to direct investment in bank debt. By using pooled investment vehicles that benefit from the bespoke credit research carried out by the managers of the MMFs, shareholders are able to mitigate some of the risk that arises from the absence of deposit insurance for institutional investors. MMFs provide a standardised, transparent and clearly-regulated vehicles with which these large, liquid and uninsurable balances can be managed.

From the regulators' point of view, the important question is this: if MMFs did not exist in their present form and at their present scale, what would happen to these large pools of cash? If the investors are seeking security and liquidity, and if MMFs were no longer able to provide these services due to regulatory reform, then these pools of cash are likely to flow into the banking system directly, or indirectly via some other form of investment vehicle. Given the investors' known preference for high credit quality, the wider banking system would thus become even more dependent upon interbank funding mechanisms to recycle surplus cash from higher rated banks to lower rated banks which were unable to attract deposits. In the absence of MMFs, the banking system would remain vulnerable to rapid asset allocation shifts from low to high credit, and from bank to sovereign credit, but the visibility of such movements would be significantly lower because they would no longer occur in standardised, transparent and clearly-regulated vehicle.

MMFs therefore make three valuable contributions to the wider safety of the financial system. First, they take retail deposits away from the insured deposit sector, reducing both the moral hazard and costs of the insured deposit system. Second, the credit analysis they undertake on banks helps to improve the quantity and quality of the monitoring of risk-taking in the financial system. Investors pay MMF managers to provide this credit management service, but the signalling function that results is of benefit to the wider market, including the regulators. If MMFs show aversion to a particular bank or group of banks - by refusing to lend or by demanding higher interest rates to lend - then the regulators are quickly made aware of problems which they might otherwise not have discovered until too late.⁶ Third, they provide an investment vehicle for the sizeable cash pools owned by risk averse institutional investors, which allows for greater transparency and regulatory control over the manner in which this cash is invested. For these reasons it is clear that a world in which MMFs did not exist would be a riskier world.

d) Policy responses

The academic literature suggests two potentially advantageous regulatory policy responses to address the problem of runs on banks: suspension of convertibility and deposit insurance. Currently regulators, with support from some academics, are proposing a third option to deal with the perceived threat of runs on MMFs, namely a change in the price structure of MMFs from stable NAV to variable NAV (see Gorton & Metrick, 2010; however Gordon & Gandia, 2012 question the validity of this proposal). This section assesses the merits of each of these policies with respect to MMFs.

⁶ Arguably the decision of MMFs to reduce investment in Eurozone banks in the summer of 2011 made clear to regulators and policy makers the seriousness of the risk profile of this group of banks and the need to act quickly to repair their credit quality.

According to Diamond and Dybvig the optimal solution to prevent a run on a bank is the introduction of deposit insurance, provided by a public authority and backed by funds provided from taxpayers. Theoretically, since the government can impose taxes after the withdrawal of cash from the bank, it can base the tax level that is imposed on an agent who withdraws cash according to the total value of withdrawals made at any particular time. The net value to early withdrawers is thereby adjusted to take account of the cost of any asset liquidations. Tax surpluses are returned to the bank to preserve liquidity for future withdrawers. It is this process that defeats the first mover advantage since, as Diamond and Dybvig write:

... for all possible anticipated withdrawal policies of other agents it never pays to participate in a bank run. As a result, no strategic issues of confidence arise (Diamond & Dybvig, 1983, p.415).

In practice, most deposit insurance schemes use a fixed-rate premium which is not adjusted to the riskiness of the bank's asset portfolio, which introduces the problem of moral hazard, and non-optimal tax raising schemes, which introduce further distortions into the model. It is for these reasons - the imperfections of policy solutions in the real world - that academics have suggested that deposit insurance should only be available for retail demand deposits and that the credibility of the scheme will depend on the perceived ability of the government to fund the insurance liabilities.

These caveats suggest that deposit insurance would not be an attractive solution to the problem of runs from MMFs. Institutional deposit insurance would relieve institutional investors from the requirement to carry out their own credit assessment of the riskiness of banks to whom they lend, which would increase the problem of moral hazard, and the potential size of the liabilities that the government might need to cover. In turn, this would reduce the credibility of the deposit insurance scheme: there are few governments in the world that are capable of standing fully behind the deposit liabilities of their domestic banking system: the US and the UK have managed this in recent years;⁷ whereas Iceland and Ireland found the burden crippling and bank bailouts turned into sovereign bailouts. Moreover, since in some cases the institutional investors that own shares in MMFs are not themselves domiciled in the same tax jurisdictions as the MMFs, there is a risk that taxpayers in one jurisdiction would become liable for the actions of agents from another tax jurisdiction, raising political problems of fairness and accountability.

If deposit insurance is inappropriate and impractical for institutional investors, what of the current proposal to change the price structure of MMFs, so that stable NAV is replaced by variable NAV? The first argument in favour of this change - about which we have already

⁷ Interestingly, the MMF back-stop fund introduced by the FRS in the US in September 2008 ended up costing the taxpayer nothing. Once the promise to support MMFs had been made, so the need to provide support disappeared.

expressed considerable scepticism - is that it would make clearer to investors that their equity holding in a MMF was unlike an insured demand deposit. A second argument is that the price variation of a MMF during normal times would make it less likely that investors would perceive that there was a first mover advantage to be gained by redeeming early from a MMF. Variable NAV funds, it is said, are more resistant to bank runs than stable NAV funds because the first mover advantage is reduced. However, when subjected to critical scrutiny this argument can be seen to be quite as implausible as the first.

It is true that the "penny rounding" price structure gives MMFs a cosmetic resemblance to bank demand deposits, notwithstanding the four important differences between the two contracts that were described earlier. From which it follows that, if requiring MMFs to abandon the stable par value of investors' equity in favour of variable pricing would signal a reduction in the first mover advantage and thereby reduce the risk of a run on a MMF, then, by parity of reasoning, it should also be the case that requiring banks to abandon the par value of demand deposits in favour of a variable price that reflected the bank's internal risk-model estimate of the value of its asset portfolio, would signal a reduction in the first mover advantage and thereby reduce the risk of a run on the bank. When comparing banks and MMFs, if what matters is their economic function rather than their legal form then it must be the case that what would deter a run in a MMF would also deter a run in a bank. It is to the great demerit of this proposal that in the extensive literature on bank runs there is no recommendation that the par value of demand deposits be changed. Given the length and depth of academic research on bank runs, by comparison with the rather recent interest shown by regulators and policy makers into research on MMF runs, it is quite remarkable that the preferred solution for MMFs is one without precedent in banking regulation.

As has already been noted, most of the withdrawals from MMFs in September 2008 were from institutional investors not retail investors. Likewise, and contrary to popular perception, when there was a run on Northern Rock Bank in September 2007, the retail branch deposits were the most stable of all deposits and the wholesale deposits (from banks, MMFs and other institutional investors) were the most prone to run (Shin, 2009). Yet, it is clear that these institutional investors were not "running" because they perceived a first mover advantage in so doing. They withdrew cash because of their need to deleverage and/or de-risk their portfolios, as a response to deteriorating conditions in the markets:

...when a crisis strikes, risk constraints bind and lenders cut back their exposures in response. But whatever the reason for the prudent cutting of exposures by the creditors to Northern Rock, their actions will look like a "run" from the point of view of Northern Rock itself. In this sense, the run on Northern Rock may be better seen as the tightening of constraints on the creditors of Northern Rock rather than as a coordination failure among them (Shin, 2009, p.110).

The key point here is that regulatory policy makers need to take account of what the process looks like from the depositor/investor point of view (i.e. a prudent cutting of exposures)

rather than what it looks like from the bank or MMF point of view (i.e. a run). If the regulatory policy is supposed to work by changing the motivations of the depositor/investor, then it helps to understand the sources of these motivations. In the case of Northern Rock the run by wholesale investors was not based on a perception of first mover advantage but on the desire to reduce credit exposures.

To make this point clearer, consider the difference in the outcomes to first movers and last movers during and after a run on a bank and a MMF. (In this case we are assuming the investors are institutional and therefore not covered by deposit insurance). As Table 1 shows, the outcomes for first movers are the same regardless of the product: early withdrawal from a bank and a MMF both secure the full value of the deposit/investment at par. However, whereas last movers from a MMF risk a value slightly below the full value of their investment,⁸ last movers from a bank risk losing access to the full value of their deposit pending insolvency proceedings, with the eventual recovery of only a small percentage of the value of their deposit when creditors are finally paid out (possibly some years later).

Table 1

	Bank demand deposit	MMF share
First mover	Par value	Par value
Last mover	Par value <i>or</i> residual payment after insolvency	Par value <i>or</i> just below par value after the fund is wound up

From the investors' perspective, the benefit of being a first mover rather than a last mover is significant if they hold a demand deposit, but is marginal if they own a share in a MMF. This reflects the fundamental economic difference between the two products, adverted to earlier. Banks hold fractional reserves, issue standard demand deposit contracts and operate under a sequential service constraint. If there is a run on the bank, creditors form a queue and those at the front of the queue get paid back until the bank declares itself insolvent, at which point no creditors get anything back until the outcome of a lengthy insolvency process. From an investors' point of view the outcomes are binary: you are paid back in full or you are not paid back at all. This is why it makes sense to run to the front of the queue: the first mover is significantly advantaged.

MMFs are equivalent to 100% reserve banks that issue constrained equity contracts. They do not guarantee the full repayment of capital and they do not guarantee daily liquidity: these benefits are provided on a "best endeavours" basis and while the MMF sponsor might suffer reputational damage if they cannot repay equity shares in full and on demand, they are not contractually obliged to do so. Further, the equity contract is not a sequential service

⁸ For example, investors in the Reserve Fund, the MMF that "broke the buck" in September 2008 and subsequently closed, received 99.1 cents on the dollar.

contract: MMF sponsors might decide to suspend or limit redemptions from their funds in order to protect the interests of all shareholders.⁹ Where an investor stands in the queue does not determine how much of their investment is repaid. The outcome for investors in MMFs is not binary: they might be paid back in full immediately, or they might be paid back in full after a delay, or they might be paid back slightly less than the full value of their investment if the fund "breaks the buck". Therefore it makes far less sense to run to the front of the queue, because the first mover secures at most only a modest advantage.

Not only is it the case that MMFs, properly understood, are less vulnerable to runs than banks, it is also the case that stable NAV funds are equally resistant to bank runs as variable NAV funds. A fund with a price that varies marginally day-by-day in a normal market environment, offers no better protection to investors in a period of market turmoil compared with a fund with a stable price. The variable price offers no protection to investors if the value of assets in the fund start to fall. In a MMF with a stable NAV all investors will be able to redeem equally at par until such time that the fund is unable to provide daily liquidity and/or maintain its price at 1.00. At this point the fund directors might suspend or limit redemptions from the fund, or might allow the fund to "break the buck" and move to variable pricing. From this point onwards all investors will be able to redeem at a lower price and/or under a specific constraint on the volume of daily redemptions. In a MMF with a variable NAV exactly the same process would be followed. Once the fund's natural liquidity had been exhausted the fund directors would either suspend or limit redemptions from the fund, or the fund would fall in value to reflect the falls in market prices of its assets. The fact that the fund's price changes marginally from day-to-day cannot prevent a loss of liquidity due to withdrawals or a loss of value due to falling secondary market prices. In both stable and variable NAV fund the first mover is slightly better off than later movers, who are slightly better off than last movers: but to the extent that any disadvantage is experienced, it is caused by a loss of liquidity and falling asset prices and not by the pricing structure of the fund.

From the investors' point of view, the factors that determine whether they are able to withdraw funds from a MMF by selling their share and what value they receive for this share are, first, the amount of natural liquidity in the fund and, second, the ability of the fund to create new liquidity by selling assets into the secondary market. Neither of these factors is influenced in any way by the price structure of the fund. A MMF with a variable NAV that is short of liquidity and finding it hard to sell assets at close to their face value has no advantage over a MMF with a stable NAV in a similar environment. Unless investors are systematically deceived as to nature of the equity share they own and its sources of value, they have no reason to prefer a variable to a stable NAV fund; likewise they would have no reason to exit a stable NAV fund sooner than a variable NAV fund.

⁹ In Europe, under UCITS legislation, it is a requirement that the fund directors treat the interests of all shareholders equally.

One final observation about the recommendation that MMFs change from stable to variable NAV pricing. The claim - which we believe to be deeply flawed- is that variable pricing reduces the incentive for investors to redeem from MMFs, thereby lowering the level of systemic risk. In circumstances where, for whatever reason, a run on the MMF sector has already started, the use of variable pricing would provide no assistance in mitigating the risk. Trying to prevent a run is one task; dealing with a run is a completely different task. The price structure of MMF makes no difference once the run is underway: the fund will be forced to sell assets into falling markets, thereby contributing to the loss spiral and amplifying the level of risk across the financial markets as a whole. Variable NAV turns out to be neither a prevention nor a cure.

It is this thought that brings us back to the idea of suspension of convertibility. While Diamond and Dybvig showed that this policy was a second best for retail demand deposits, it appears to be the most promising policy for shares in MMFs. Suspension of convertibility means the temporary abandonment of the standard terms whereby contracts are terminated and cash is returned to investors. For banks this means that deposits are no longer able to be redeemed on demand. Investors must wait to gain access to their cash, which often turns out to be unpopular and might lead to a reduction in social welfare (Sprague, 1908; Friedman & Schwartz, 1963; and Ennis & Keister, 2009).

The theory behind the suspension of convertibility in banking is that the standard terms of the deposit contract, while appropriate for standard market conditions, become inappropriate when market conditions deteriorate. At this point some form of "escape clause" should be invoked. For banks, this might mean allowing reserves to decline below a statutory minimum; or it might mean using a "life-boat operation" to rescue a particular bank that was in difficulty. When there is a generalised run on the whole banking system, suspension of convertibility is the best form of escape clause because it prevents contagion spreading within the system (Eichengreen, 2008, p.36-37).

For MMFs the suspension of convertibility might mean that the fund limits (in whole or in part) the ability of shareholders to sell their shares for cash for a period of time (known as a "liquidity gate"); or it might mean that the fund imposes a charge on shareholders who sell shares, equivalent to the cost of restoring liquidity in the fund to its pre-redemption levels (known as a "liquidity fee"). In either of these cases the standard terms of the equity contract - between the MMF and the shareholders - would be suspended, pending the resumption of normal market conditions. Given the very short maturity profile of the assets held by MMFs, and the transparent nature of their asset holdings, the restoration of the natural liquidity of the fund would take place very quickly and publicly. By comparison with banks, suspension of convertibility for MMFs would be a shorter and less painful process.

There are three reasons why the ability to suspend or limit redemptions from a MMF looks to be the most promising regulatory policy tool to reduce the risk of runs of MMFs. First,

given the legal and economic structure of a mutual fund, suspension of convertibility makes sense because the equity contract is by nature conditional. While this might seem no more than serendipitous, in fact it makes regulatory policy changes in this area easy to introduce for MMF sponsors and easy to explain to MMF investors, which are both non-negligible gains when it comes to improving financial sector regulation. For a bank, the refusal to redeem a demand deposit is a breach of contract; for a MMF, the refusal to allow an investor to sell their shares on any particular day, if to do so would unfairly disadvantage other shareholders, is an implicit element of the equity contract.

Second, if all investors know and understand that the MMF sponsor would suspend convertibility if and when the fund can no longer provide liquidity to redeeming investors without disadvantaging non-redeeming investors - i.e. no investor is disadvantaged by the actions of other investors - then the first mover advantage is removed. There is no need to try to run to the front of the queue if those at the front of the queue cannot gain benefit from their position in the queue. There is no shame in being the last mover if the last mover ends up with the same value as every other mover. The equal treatment of all shareholders is, at the same time, both a fundamental principle of mutual fund management and the best protection of funds against runs.

Third, the suspension of convertibility provides the best mitigation against a loss spiral in the event of a widespread run on banks and MMFs. If, as in September 2008, MMFs experience unusually large redemption demands, which in turn would require significant sales of assets in falling markets, and there is a risk of a significant amplification of market distress, the best option for MMF sponsors, MMF investors and regulators is an orderly, industry-wide suspension of convertibility. Rational investors will understand that they have no need to run, but in the extreme case that some (or all) try to run because of widespread panic in the markets, the MMF industry needs to be able to impose conditions upon the equity contract with regard to convertibility and these conditions need to treat all shareholders equally. In short, if MMFs are able to suspend or limit fund redemptions - by the use of a liquidity gate or a liquidity fee - then investors cannot run because the door is shut, and it could only be opened for them upon the payment of an appropriate price.

Conclusions

Certain of the policy proposals in the recent IOSCO, FSOC and FSB reports are based on a faulty analysis of the academic literature on bank runs and the first mover advantage. While these regulatory reports list the many real and substantial risks that exist in short-term money markets, none of them is able to establish a credible causal connection between these risks and the pricing structure of MMFs. Tinkering with price structure of MMFs will not achieve the benefits that are claimed. A world in which all MMFs had converted to

variable NAV would not be a world with lower systemic risk: much effort would have been expended, but for no discernible benefit.

In the absence of a credible deposit insurance policy for the MMF industry, suspension of convertibility should be the preferred option: for regulators, for MMF sponsors and for investors. Liquidity gates and liquidity fees provide the clearest disincentive to institutional investors to seek to gain a first-mover advantage by running from their fund; they also provide the strongest policy tool to stop a run once it is underway, by breaking the downward value spiral.

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Bibliography

Bagehot, Walter (1873), *Lombard Street: A Description of the Money Market*, London, Henry King.

Bernado, Antonio & Welch, Ivo (2004), "Liquidity and Financial Market Runs", *Quarterly Journal of Economics* 119, pp.135-158.

Brunnermeier, Markus (2009), "Deciphering the Liquidity and Credit Crunch, 2007-2008", *Journal of Economic Perspectives* 23(1), pp. 77-100.

Calomiris, Charles (1990), "Is Deposit Insurance Necessary? A Historical Perspective", *Journal of Economic History* 50(2), pp. 283-295.

Cooper, Russell & Ross, Thomas, (2002), "Bank Runs: Deposit Insurance and Capital Requirements", *International Economic Review* 43(1), pp. 55-72.

Demirgüç-Kunt, Asli & Kane, Edward (2002), "Deposit Insurance around the Globe: Where does it work?", *Journal of Economic Perspectives* 16(2), pp.175-195.

Diamond, Douglas & Dybvig, Philip (1983), "Bank Runs, Deposit Insurance, and Liquidity", *Journal of Political Economy*, 91(3), pp.401-419.

Diamond, Douglas & Dybvig, Philip (1986), "Bank Theory, Deposit Insurance, and Bank Regulation", *Journal of Business* 59(1), pp.55-68.

Diamond, Douglas & Rajan, Raghuram (2001), "Liquidity Risk, Liquidity Creation and Financial Fragility: A Theory of Banking", *Journal of Political Economy* 109(2), pp.287-327.

Eichengreen, Barry (2008), *Globalizing Capital: A History of the International Monetary System*, second edition, Princeton University Press.

Ennis, Huberto & Keister, Todd (2009), "Bank Runs and Institutions: The Perils of Intervention", in *American Economic Review* 99(4), pp. 1588-1607.

Friedman, Milton & Schwartz, Anna Jacobson (1963) *A Monetary History of the United States, 1867-1960*, Princeton University Press.

FSB (2012), "Strengthening Oversight and Regulation of Shadow Banking Entities: An Integrated Overview of Policy Recommendations", November 2012.

FSOC (2012), "Proposed Recommendations Regarding Money Market Mutual Fund Reform", November 2012

Gordon, Jeffrey & Gandia, Christopher (2012), "Money Market Funds Run Risk: Will Floating Net Asset Value Fix the Problem?", Centre for Law and Economic Studies, Columbia Law School, Working Paper 426, September 2012.

Gorton, Gary & Metrick, Andrew (2010), "Regulating the Shadow Banking System", *Brookings Papers on Economic Activity*, Fall 2010, pp.261-312.

IOSCO (2012), "Policy Recommendations for Money Market Funds", October 2012.

Jacklin, Charles & Bhattacharya, Sudipto (1988), "Distinguishing Panics and Information-based Bank Runs: Welfare and Policy Implications", *Journal of Political Economy* 96(3), pp.568-592.

Kareken, John (1986), "Federal Bank Regulatory Policy: A Description and Some Observations", *Journal of Business* 59(1), pp.3-48.

Lieberman, Marvin B & Montgomery, David B (1988) "First Mover Advantages", *Strategic Management Journal* 9, pp.41-58.

McCabe, Patrick E (2010), "The Cross Section of Money Market Fund Risks and Financial Crises", Federal Reserve Board, Washington DC, September 2010.

McCulloch, J Huston (1986), "Bank Regulation and Deposit Insurance", *Journal of Business* 59(1), pp.79-85.

Postlewaite, Andrew & Vives, Xavier (1987), "Bank Runs as Equilibrium Phenomenon", *Journal of Political Economy* 95(3), pp.485-491.

Pozsar, Zoltan (2011), "Institutional Cash Pools and the Triffin Dilemma of the US Banking System", IMF Working Paper, WP/11/190, August 2011.

Shin, Hyun Song (2009), "Reflections on Northern Rock: The Bank Run that Heralded the Global Financial Crisis", *Journal of Economic Perspectives* 23(1), pp.101-119.

Sprague, Oliver M W (1908), "The American Crisis of 1907", *The Economic Journal* XVIII, September 1908, pp. 353-372.