

# Money Market Funds Run Risk: Will Floating Net Asset Value Fix the Problem?

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ABSTRACT

*The instability of money market mutual funds, a relatively new form of financial intermediary that connects short term debt issuers with funders that want daily liquidity, became manifest in the financial crisis of 2007-2009. The bankruptcy of Lehman Brothers, a major issuer of money market debt, led one large fund to “break the buck” (that is, violate the \$1 net asset valuation convention) and triggered a run on other funds that was staunch only by major interventions from the US Treasury and the Federal Reserve. One common reform proposal has been to substitute “floating NAV” for “fixed NAV,” on the view that MMF run risk was strongly affected by the potential to arbitrage between the “true” value of MMF assets and the \$1 fixed NAV. It turns out that European MMFs are issued in two forms, “stable NAV” and “accumulating NAV,” which offer a reasonable proxy for the distinction between fixed and floating NAV. Thus the comparative run rate of these two MMF types during “Lehman week” offers a natural experiment of the effect of NAV “fixedness.” We find that the stable/accumulating distinction explains none of the cross-sectional variation in the run rate among these funds. Instead, two other variables are explanatory: yield in the period immediately prior to Lehman week, which we take as a proxy for the fund’s portfolio risk, and whether the fund’s sponsor is an investment bank, which we take as proxy for sponsor capacity to support the fund. We then argue that these findings indicate that other stability-enhancing reforms are necessary.*

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JEL: G15, G21, K23

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Money market funds (“MMFs”) were at ground zero of the financial crisis.<sup>1</sup> Lehman Brother failed on Monday, September 15. One day later, an important money market fund, the Reserve Primary Fund, “broke the buck” because of its holdings of Lehman short-term debt, even though these holdings amounted to only 1.2 percent of the Reserve Primary Fund’s portfolio, well below the five percent single-issuer maximum of the SEC’s rules.<sup>2</sup> Immediately thereafter, investors – led by institutional investors -- began to withdraw from other “prime” money market funds.<sup>3</sup> During “Lehman Week” these withdrawals -- call it a run -- amounted to approximately \$300 billion, approximately 15 percent of prime money market fund assets. Several other money market funds almost broke the buck, rescued by interventions from their sponsors.<sup>4</sup> Pressure arose not because of the serial bankruptcy of other issuers of money market instruments, but rather from risk-fleeing investors who wanted to switch to Treasury securities or cash. Their redemptions exhausted the funds’ cash reserves. As redemption requests accelerated and as the short term credit market froze, funds faced the prospect of selling assets at fire sale prices. The realization of such shortfalls would have meant below-\$1 NAV at many funds. Indeed, the \$0.97 valuation initially anticipated from the Reserve Primary Fund liquidation – which exceeded the 1.2 percent projected loss on its Lehman holdings – reflected this phenomenon.<sup>5</sup>

The US Government rode to the ultimate rescue. On Friday, September 19, 2008 the US Treasury announced a “Temporary Guarantee Program for Money Market Funds.” This program, capitalized by the then-\$50 billion Exchange Stabilization Fund, offered a US government guarantee on all existing deposits in participating money market fund deposits, in effect, the entire .5 trillion industry.<sup>6</sup> On the same day, the Fed

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<sup>1</sup> The following account relies on the Congressional Oversight Panel, Guarantees and Contingent Payments in TARP and Related Programs 27-34 (Nov 6, 2009); Investment Company Institute, Report of the Money Market Working Group 47-66 (March 17, 2009); Naohiko Baba, Robert N. McCauley & Srichander Ramaswamy, US Dollar Money Market Funds and non-US Banks, BIS Quarterly Review (March 2009).

<sup>2</sup> See 17 C.F.R. § 270.2a-7(c)(4)(i)(A) (2008) (SEC Rule 2a-7). Money market funds are a type of open-ended mutual fund, which are generally valued on the basis of the “net asset value” (“NAV”) of their portfolios. As elaborated below, money market funds are valued by convention at a \$1.00 NAV, unless and until the actual NAV of the fund slips below \$.995, at which point the fund is said to have “broken the buck.”

<sup>3</sup> “Prime” funds may hold issuance of highly-rated non-governmental issuers.

<sup>4</sup> See note 20 infra and text accompanying notes 55-57 infra. Moody’s Investor Service, Sponsor Support Key to Money Market Funds (Aug. 9, 2010) .

<sup>5</sup> The ultimate liquidation turned out somewhat better than anticipated for the Reserve Primary Fund shareholders. As of June 2009 the SEC expected Fund shareholders to receive \$.984, including interest received after the Fund was closed. The Fund’s investors ultimately received slightly more, \$.99, in large part because of higher realizations on Lehman Brothers securities in bankruptcy. The final payout came in July 2011. None of these valuations takes account of the shareholders’ lost liquidity during the period. See *In re the Reserve Fund Securities and Derivative Litigation*, 673 F. Supp.2d 182 (S.D.N.Y. 2009); 732 F.Supp.2d 310 (S.D.N.Y. 2010); *The Primary Fund in Liquidation*, Additional Information Regarding the Primary Fund Liquidation (July 29, 2011), available at <http://www.primary-yieldplus-inliquidation.com/pdf/FundUpdate-July2011.pdf>.

<sup>6</sup> Press Release, U.S. Department of the Treasury, Treasury Announces

announced it would use emergency powers to create a credit facility to fund no-risk bank purchases of asset-backed commercial paper from MMFs, the “Asset-Backed Commercial Paper MMF Liquidity Facility.”<sup>7</sup> These purchases, at amortized-cost, were funded by non-recourse Fed loans matched to the maturity of the purchased assets. Asset-backed commercial paper (“ABCP”) constituted, as a class, the dodgiest money market instruments on offer, since they largely represented claims on pools of mortgage-backed securities and other receivables created off-balance by various financial institutions. Ordinarily loans against securities like ABCP would be over-collateralized, to protect the Fed against loss, but the structural inability of MMFs to bear loss required a concessionary set-up. Moreover, the Fed lent money to fund the ABCP purchases at its primary credit rate, which meant that the banks earned a spread between the ABCP rate and the Fed rate. Both of these moves contradicted the Bagehot dictum for central bank behavior in a crisis: to lend freely to solvent firms against good collateral at a penalty rate.<sup>8</sup> Why? Apart from liquidity support, the Fed was also protecting Treasury’s somewhat undercapitalized guarantee by taking the credit risk on the most fragile MMF assets.<sup>9</sup> The Treasury guarantee was never called upon but the Fed lent out \$150 billion under this program in its first 10 days.<sup>10</sup>

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Expiration of Guarantee Program for Money Market Funds (Sept 18, 2009), available at <http://www.treas.gov/press/releases/tg293.htm>. The COP reports that 1486 MMFs participated, representing \$3.2 trillion (93% of the industry total). Presumably most of the uninsured funds invested solely in US Treasury securities. That many “government” funds participated may reflect investments in “agency” securities, debt issued by the “Government Sponsored Entities,” (“GSE”), Fannie Mae and Freddie Mac, which were then in conservatorship and whose debt was trading at below par. The program was extended twice, finally expiring a year later. Treasury collected \$1.2 billion in fees but was never called to perform on its guarantee.

<sup>7</sup> See Federal Reserve Board, Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (“AMLF”), <http://www.federalreserve.gov/monetarypolicy/abcpmmmf.htm>; Federal Reserve Discount Window, AMLF Frequently Asked Questions, <http://www.frbdiscountwindow.org/mmmf.cfm?hdrID=14#f14>. Fed AMLF FAQs; Bucu Duygan-Bump et al, How Effective Were the Federal Reserve Emergency Liquidity Facilities? Evidence from the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, Fed. Res. Bank Boston WPS No. QAU10-3 (Ap. 29, 2010). <http://www.bos.frb.org/bankinfo/qau/wp/2010/qau1003.pdf> (forthcoming 2013 J. Fin.) See also THE FEDERAL RESERVE’S SECTION 13(3) LENDING FACILITIES TO SUPPORT OVERALL MARKET LIQUIDITY: FUNCTION, STATUS, AND RISK MANAGEMENT, Office of the Inspector General of the Federal Reserve Board, at 59-66, 64.

<sup>8</sup> Walter Bagehot, Lombardy Street (1873).

<sup>9</sup> The Fed expanded the capabilities of institutions to access the AMLF on January 30, 2009. The expanded capabilities provided i) a temporary limited exception eliminating any capital requirements for purchases of ABCP through the facility and ii) a temporary limited exception to sections 23A and 23B of the Federal Reserve Act. See *IG Report* at 62-63, *supra* note 7. These exemptions effectively reduced the cost of purchasing ABCP (eliminating capital requirements) and removed limitations on the quantity of ABCP an institution could purchase from a sponsored MMF. The need for these exemptions also points to a limitation in the strategy of sponsor support for struggling MMFs, since many fund complexes could not be supported within the existing affiliate-lending constraints that applied to banks.

<sup>10</sup> Nine of the ten largest MMFs, representing two-thirds of all MMF assets, used the AMLF. Only Vanguard did not use the emergency credit facility. See Ben Levisohn & Daisy Maxey, *Absent Help, More Funds Might Have Broken Buck*, Wall St. J Online, Dec. 1, 2010,

Because of the shrinkage of prime MMF assets and because of the shift by those MMFs to Treasury securities, parties that counted on such financing faced an immediate funding crisis. The Fed therefore created an additional emergency facility, the “Commercial Paper Funding Facility,” to support commercial paper issuers, especially asset-backed securitization vehicles, which could no longer count on purchases from money market funds.<sup>11</sup> In the first week, this Fed facility bought \$144 billion in commercial paper. Maximum use of this facility peaked at \$350 billion in January 2009.<sup>12</sup>

These large scale government interventions successfully halted the run and stabilized money markets.<sup>13</sup> At yearend 2008, prime MMFs had virtually the same level of assets as at yearend 2007.

Addressing the fragility of money market funds has been a major post-Crisis regulatory objective. In 2010 the SEC adopted changes to the 1940 Act rule that governs MMFs so as to raise standards on portfolio securities, shorten maturities, increase liquidity requirements, and spell out orderly liquidation procedures for firms that “break the buck.”<sup>14</sup> However, a wide range of discussants inside and outside of the government

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<http://online.wsj.com/article/SB10001424052748704594804575648872562084814.html>. Use of the AMLF was widespread among MMFs – 105 MMFs participated; participation was heaviest among institutional funds. Bucu Dygan-Bump et al, *supra* n. 6, at 12. Treasury charged for its guarantee. The Fed did not.

<sup>11</sup> See Tobias Adrian, Karin Kimbrough & Dina Marchioni, The Federal Reserve’s Commercial Paper Funding Facility, FRBNY Econ. Pol. Rev. 25, May 2011, <http://www.newyorkfed.org/research/epr/11v17n1/1105adri.pdf>.

<sup>12</sup> European banks also faced a funding crisis because US MMFs, which had been the major purchasers of dollar denominated CDs issued by these banks withdrew from this market. The Fed entered into uncapped swap lines with European central banks that amounted over \$200 billions. See Baba et al, note 1 *supra*, at 76-77; *IG Report* at 77, *supra* note 7.

<sup>13</sup> The Fed also created the Money Market Investor Funding Facility (“MMIFF”) on October 21, 2008. The MMIFF created a special purpose entity (“SPE”) to purchase the assets of MMFs with 90% cash and 10% subordinated commercial paper issued by the SPE. Effectively, the participating MMFs would collectively self-insure and take the first 10% loss on the combined assets purchased under MMIFF. The facility was never participated, as the MMFs were unwilling to assume any risk. *See generally IG Report* at 89, *supra* note 7. The creation of the MMIFF shows the Fed’s resolve to support MMFs during the financial crisis. More revealing is the way the absence of capital constrains the kind of liquidity support the Fed can provide. As the comparison between the AMLF and the MMIFF demonstrates, MMF cannot take the usual “haircut” associated with collateralized loans from a lender-of-last-resort. This means that Fed liquidity support will entail risk-bearing that is not customary for a lender-of-last-resort, a subsidy in effect to the industry.

<sup>14</sup> See Money Market Fund Reform, Investment Company Act Release No. 29132 (Feb. 23, 2010) [75 FR 10060 (Mar. 4, 2010)] (amending 1940 Act Rule 2a-7). These are well-described in Jill Fisch & Eric Roiter, A Floating NAV for Money Market Funds: Fix or Fantasy? (forthcoming Univ. of Illinois L. Rev. 2012), available at <http://ssrn.com/abstract=1923828>.

have regarded these SEC actions as insufficient or incomplete,<sup>15</sup> perhaps even counter-productive.<sup>16</sup>

Exactly what further policy intervention to take has been contentious.<sup>17</sup> The industry has preferred an emergency liquidity facility, in effect a discount-window version of the support provided by the Federal Reserve during the crisis.<sup>18</sup> Some parties, including former Fed Chairman Paul Volcker, have endorsed floating net asset value, on the view that the dynamics of a fixed NAV significantly figures into run risk.<sup>19</sup> Other parties favor a loss-absorbency layer for each fund, in effect, capital. Currently a fund's capacity to absorb loss from a defaulting security or a security that trades below its amortized cost depends upon the sponsor's willingness to cover the shortfall.<sup>20</sup> As in the case of the Reserve Primary Fund, a sponsor may be unable to cover such a loss or unwilling to do so.<sup>21</sup>

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<sup>15</sup> Compare See US Treasury Dep't, Financial Regulatory Reform: A New Foundation, [http://www.financialstability.gov/docs/regs/FinalReport\\_web.pdf](http://www.financialstability.gov/docs/regs/FinalReport_web.pdf) (June 2009); Investment Company Institute, Report of the Money Market Working Group 47-66 (March 17, 2009); Group of 30, Financial Reform: A Framework for Financial Stability, <http://www.group30.org/pubs/recommendations.pdf>; (Feb. 2010); Report of the President's Working Group on Financial Markets: Money Market Fund Options (Oct. 2010); Squam Lake Group, Reforming Money Market Funds (Jan. 14, 2011).

<sup>16</sup> For example, the SEC's post-2008 reforms shortened portfolio maturities. This may enhance liquidity, but it also makes it easier for funds to not roll over their assets, which adds to systemic fragility because of the immediate funding shortfalls on the demand side. The shortened maturities will also change the composition of MMF portfolios. Non-financial firms are not well-equipped to use short term liabilities to finance long term assets. Thus financial firms, which specialize in such maturity transformation, will increase their share of MMF financing. Indeed, this has already occurred. See note 24 infra. As the financial crisis demonstrated, financial firm solvency is likely to be highly correlated. Thus the effect to address stability by enhancing liquidity may well undermine stability by creating correlated solvency risk.

<sup>17</sup> Some think there is no problem to be addressed. E.g., Jonathan Macey, Reducing systemic Risk: The Role of Money Market Mutual Funds as Substitutes for Federally Insured Bank Deposits, 17 Stan. J. L. Bus. & Fin 131 (2011).

<sup>18</sup> See Investment Co. Institute Comment to the SEC, Jan 10, 2011, available at [http://www.ici.org/pdf/11\\_sec\\_pwg\\_com.pdf](http://www.ici.org/pdf/11_sec_pwg_com.pdf).

<sup>19</sup> See generally Group of Thirty, Financial Reform, A Framework for Financial Stability (January 2009) at 29 (Recommendation 3).

<sup>20</sup> SEC Chairman Mary Shapiro recently referred to an internal SEC study that identified sponsor support on more than 300 occasions since the first MMF offerings in the 1970s. Chairman Mary Shapiro, Testimony on "Perspectives on Money Market Mutual Fund Reform Legislation," Sen. Comm on Banking, Housing, and Urban Affairs (June 21, 2012). See also Moody's, US Money Market Fund Proposals Are Credit Positive for Investors; Negative for Sponsors, July 2, 2012, at 2 (at least 201 instances of sponsor support 1980-2011). Searching through SEC no-action letters, Kacperczyk and Schnabl found 47 instances of sponsor support during 2008. Marcin Kacperczyk & Philipp Schnabl, The Risk-Taking Incentives of Money Market Funds February 2012 (Appendix), available at <http://economics.mit.edu/files/7588>. For other estimates of the extent of sponsor support of MMFs during the financial crisis, see text accompanying notes 54-57 infra.

<sup>21</sup> These risks become greater as concentration in the MMF industry grows. As of May 31, 2012, approximately 50% of MMF assets are held by funds of five sponsors. The top three sponsors, Fidelity, JP Morgan Chase, and Federated, account for approximately 35% of MMF assets. The top ten sponsors account for approximately 75% of MMF assets. CraneData.com, web-site visited July 8, 2012; authors' calculations.

For a time disagreement among the SEC Commissioners blocked consideration of further regulatory action. The deadlock provoked the Federal Stability Oversight Council into offering its own proposals for MMF reform.<sup>22</sup> Three reform options were offered: floating NAV, a combination of a sponsored-supplied “NAV buffer” – capital – and a “minimum balance at risk” for MMF users, or a higher level of sponsored-supplied NAV buffer and other risk-reducing measures.<sup>23</sup> Fearful of losing its regulatory autonomy (and after a change of Chairs), the SEC finally came forward with its own reform proposals.<sup>24</sup> Two major proposals are on offer: floating NAV for institutional funds, fixed NAV for the rest; or retention of fixed NAV, but liquidity fees or “gates” on investor redemptions at times of financial stress, both measures optional with the fund.

Floating NAV has been a favorite reform strategy because it eliminates the regulatory artifact (to adopt a more neutral term than “distortion”) that distinguishes money market funds from other mutual funds.<sup>25</sup> Rule 2a-7 permits MMFs to report a fixed \$1 NAV as long as the difference between the market value of the fund’s portfolio and its aggregate amortized cost does not exceed a \$0.005 band. That is, if a fund’s NAV is greater than or equal to \$0.995 it can report a \$1.00 NAV. Proponents claim that floating NAV will reduce run risk because (i) it would eliminate the fund users’ incentive in distressed markets to arbitrage between the \$1.00 and the actual market value, (ii) it will condition investors to understand that “markets fluctuate” so that a decline in market prices does not necessarily signal an imminent default on portfolio securities, and (iii) it

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<sup>22</sup> Proposed Recommendations Regarding Money Market Mutual Fund Reform, Financial Stability Oversight Council, 77 Fed. Reg. 69455 (Nov. 19, 2012).

The FSOC proposals emanated from the Council’s separate authority to address systemic risks apart from actions of the primary regulator. See secs. 120, 113, Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. 111-203 (July 21, 2010). In the face of deadlock at the SEC, the FSOC’s 2012 Annual Report identified money market funds as presenting “structural vulnerabilities in wholesale short-term funding markets” that required “structural reforms.” Financial Stability Oversight Council, 2012 Annual Report, Recommendation 3.1, <http://www.treasury.gov/initiatives/fsoc/Pages/annual-report.aspx>. The FSOC can make specific recommendations to the SEC and thereby force a resistant SEC to offer public explanation. See Dodd-Frank, Sec. 120, codified at 12 U.S.C. §5330. Or the FSOC can determine that specific MMFs or sponsors “could pose a threat to the financial stability of the United States,” and remit them to prudential supervision by the Federal Reserve. *Id.*, sec. 113, codified at 12 U.S.C. §5323.

<sup>23</sup> In functional terms, the “minimum balance at risk” proposal called for a hold-back of 3 percent of an MMF investor’s funds (over \$100,000) for 30 days. This was designed to reverse the first-mover advantages of early redemption and thus avoid “run” dynamics at times of financial stress.

<sup>24</sup> See SEC Money Market Fund Reform; Amendments to Form Pf, , Securities Act Rel. No. 33-9408, 78 Fed. Reg. 36834 (June 19, 2013), <https://www.federalregister.gov/articles/2013/06/19/2013-13687/money-market-fund-reform-amendments-to-form-pf> {“2013 SEC MMF Reform Proposal”}.

<sup>25</sup> For a useful account of the regulatory history of amortized cost accounting for MMFs and a defense of the practice, see Jill Fisch & Eric Roiter, at text accompanying notes 28-52. For an account of the MMF industry’s early successful campaign for SEC permission to use fixed NAV, see William A. Birdthistle, *Breaking Bucks in Money Market Mutual Funds*, 2010 WIS. L. REV. 1155, 1160. The SEC granted class-wide relief permitting fixed NAV in a release entitled Valuation of Debt Instruments and Computation of Current Price by Certain Open-End Investment Companies (Money Market Funds), 48 Fed. Reg. 32,555 (July 18, 1983).

will relieve sponsors of the implicit guarantee of zero investor losses that can lead to unrealistic expectations of safety.<sup>26</sup> Opponents, especially institutional users, say that floating NAV will destroy the utility of MMF's, because it would create significant tax, accounting, and disclosure problem.<sup>27</sup>

Skeptics wonder whether floating NAV has much effect on run risk. The purported arbitrage operates over a very limited range, one-half of a penny. That's a maximum of \$50,000 on a \$10 million portfolio, not taking into account transaction costs. Not trivial but not compelling. Moreover, investors are unlikely to have the real-time pricing information that would encourage such arbitrage. Large MMF portfolios typically contain dozens of securities and many money market instruments do not trade. Instead, the strongest reasons for a run on an MMF are the same as for an uninsured bank account: uncertainty about the full payment of principal and a prisoner's dilemma dynamic in which the first party to withdraw stands the greatest chance of a full recovery. Withdrawal (immediate redemption from a fund) is rational whenever the current redemption price is higher than the "true" NAV or is significantly likely to be higher. This circumstance may arise in the case of fixed NAV, in the gap between \$1 and \$0.995, *but it is also true in the case of floating NAV*, because in a crisis that increases the default risk for MMF assets, today's NAV is likely to be a lagging, higher indicator of "true" NAV.

To unpack this point: Money market assets are likely to present a highly correlated risk of default or loss of value because they mainly consist of short term credit issuances of financial firms and their affiliates.<sup>28</sup> Financial firms are often deeply linked

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<sup>26</sup> On this view, breaking of the buck by even a single fund can trigger a run because of the high salience demonstration that sponsor support for a threatened MMF is merely common practice not a sure thing, and that such support will be based on separate sponsor calculations of convenience and capacity. The 2007 asset-backed commercial paper crisis shows the importance of this sponsor practice in maintaining stability. Although 39 funds received sponsor support, through low visibility interventions, investors did not run on MMFs; to the contrary, MMF inflows increased from investors seeking a safe haven. Yet a regime that depends on implicit third party guarantees is inherently unstable, if only because the implicit guarantor does not internalize the cost of its defection from the implicit arrangement. This then leads to the argument that floating NAV will enhance stability because it will avoid creating unsustainable expectations of sponsor support in difficult times. See generally Patrick E. McCabe, *The Cross Section of Money Market Fund Risks and Financial Crises*, Fed. Res. Bd Disc. Pap. 2010-51 (Sept. 2011), <http://ssrn.com/abstract=1898341>

<sup>27</sup> Opponents may also believe that this is the point of various reform proposals, including floating NAV, the goal of which is to make banks the exclusive provider of transaction accounts. That is, even if floating NAV does not in fact reduce run risk, it will lead many MMF users to turn to banks instead because of the transactional conveniences of a fixed dollar account. So MMFs will be less a systemic threat because they will be smaller.

<sup>28</sup> As of May 31, 2012, at least 80% of the non-governmental assets of prime MMFs were short term claims on large banks; most of these assets were claims on large foreign banks. See David Scharfstein, Testimony on "Perspectives on Money Market Mutual Fund Reform Legislation," Sen. Comm on Banking, Housing, and Urban Affairs (June 21, 2012), at 2 & Exhibit 1 (relying on Crane Data). See also Moody's Investor Service, *Money Market Funds 2010 Review and 2011 Outlook*, March 23, 2011 at 1 (Estimate that more

to another through various counterparty relationships; firms may “herd” in a way that produces similar business strategies. Both routes of systemic distress propagation mean that the failure of a significantly important financial firm is likely to lead to defaults, or the threat of default, on securities held by many MMFs. But since the short-term financial claims held by MMFs typically do not trade in secondary markets, asset prices will relatively slow to adjust, “stale” prices.<sup>29</sup> Investors will therefore see an advantage in immediate redemption at today’s higher price rather than tomorrow’s probably lower price. Investors also know that redemption by *other* investors at today’s higher, stale price, will further reduce tomorrow’s NAV.<sup>30</sup> Investors will therefore run even without a buck to break.

In short, the circumstance that produces genuine concern that the fund may break the buck and that therefore will trigger a run on a fixed NAV fund, will also produce strong concern that MMF assets will generally decline in value, which is sufficient to trigger a run on a floating NAV fund. Floating NAV run risk is a combination of two factors: a correlated expected decline in asset values and “stale pricing.”<sup>31</sup> Thus an investor in a floating NAV fund will have powerful incentives to exit ahead of an advancing wave.<sup>32</sup>

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than two-thirds of assets of prime MMFs and tax free MMFs are directly or indirectly exposed to banks). A secular trend to this effect can be established by analyzing the Federal Reserve Board’s Commercial Paper Release (financial v. non-financial categorization) in conjunction with Flow of Funds data on commercial paper held by MMFs. See the Appendix.

<sup>29</sup> See Daniel Crowitz & Chris Downing, Liquidity or Credit Risk? The Determinants of Very Short-Term Corporate Yield Spreads, 62 J. Fin. 2303 (2007); Bucu Duygan-Bump et al, *supra* note 7.

<sup>30</sup> This is because there are proportionately fewer investors to bear the losses in a now smaller pool of assets. See Qi Chen, Itay Goldstein & Wei Jiang, Payoff Complementarities and Financial Fragility: Evidence from Mutual Fund Outflows, 97 J. Fin. Econ. 239 (2010). In other words, where actual NAV is below realized NAV, each redemption increases the losses for remaining investors, because the embedded loss is distributed across a smaller investor base. This is easiest to see in the case of a fixed NAV fund, where the \$1 redemption amount may be greater than the “shadow” NAV. But the same problem arises for a floating NAV fund because of the stale pricing problem.

<sup>31</sup> Fixed NAV fund prices at a time of systemic distress are stale as a result of regulatory structure – the gap between \$1.00 and actual or “shadow” NAV. Floating NAV fund prices in similar circumstances will be stale because of the structure of the relevant asset markets.

<sup>32</sup> Consider the example in the President’s Working Group report, note 15 *supra*, as to how fixed NAV may induce a run. First, there is a default on a portfolio security, which leads to a meaningful reduction in Fund Alpha’s actual NAV. Investors in Alpha redeem to arbitrage the difference between the \$1.00 fixed NAV and the actual NAV; this may lead to wide-scale redemptions and quick sales by Alpha of fund assets to raise cash to meet redemption requests, in other words, a run. But what produces contagion from the run on Alpha to other MMFs is the correlation risk between the defaulting security and many other money market instruments. First, such correlation may produce a fire sale valuation externality (meaning: the depressed asset valuations from Alpha’s sales may force other firm’s to report lower NAV). Second, investors may also come to believe that similar securities will also default and want to redeem before realization of such losses. But note: correlated default risk will produce a run even without fixed NAV. The default of a money market security may led investors at other funds to run not because they are trying to arbitrage a gap but because want to avoid the realization of loss.

Similarly, floating NAV as means to desensitize investors to fluctuating MMF valuations seems to misperceive what drives a systemic MMF run: It is not the breaking of the buck at any particular fund, but a high-enough probability that the underlying portfolio event(s) that produced a break will correlate across MMFs generally.<sup>33</sup> The prior instance of buck-breaking, the Community Bankers Fund in 1994, provides an instructive example. The fund broke the buck because of valuation changes in a portfolio “unsuitably” concentrated (27 percent) in interest-rate sensitive structured notes. The fund was small (only \$150 million), its portfolio concentration violated the SEC rule, and the securities did not default. The fund’s idiosyncratic investment strategy (and small size) meant that the industry did not suffer a run.<sup>34</sup> By contrast, the Reserve Primary Fund (\$60 billion) held defaulted-upon securities of a large financial firm (Lehman) at a time of (i) high concentration of MMF assets in the financial sector and (ii) increasing and correlated instability among financial firms. In other words, it appears that the correlation of possible portfolio losses rather than the “focal point” effect of a buck-breaking was the main driver of the MMF run. These portfolio losses can arise not only through defaults but also through fire sale prices on non-faulted assets as funds scramble to meet redemption requests.<sup>35</sup>

The point is this: Unless floating NAV significantly reduces run risk relative to fixed NAV, it will not produce systemic stability. Instead, one of the other proposals on

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<sup>33</sup> Profs. Fisch and Roiter argue that the main reason for MMF run risk is not investors’ fear of loss on MMF portfolios, but rather lost liquidity because of uncertain consequences should a fund break the buck. Their solution is either the fund converts to floating NAV (meaning, immediate loss realization for investors reflected in NAV), or, for liquidating funds, in effect, a partial suspension of convertibility. Specifically, investors would be able to redeem part of their investment, pending a final winding up of a fund. See Jill Fisch & Eric Roiter, note 19, supra.

Another way to frame the Fisch & Roiter point is to say that fixed NAV adds a distinct vector of run pressure, not found in floating NAV funds, because breaking the buck triggers a liquidation that deprives investors of liquidity for a substantial period, even if the ultimate losses are relatively small. The liquidity costs of a fixed NAV fund’s breaking the buck are addressed in detail in Patrick E. McCabe, Marco Cipriani, Mochael Holscher & Antoine Martin, *The Minimum Balance at Risk: A Proposal to Mitigate the Systemic Risks Posed by Money Market Funds*, Fed. Res. Bd. Dis..P. 2012, at 31-35, <http://www.federalreserve.gov/pubs/feds/2012/201247/201247pap.pdf>. Such liquidity risk seems secondary to the underlying correlated solvency risks that are fundamental to a systemic run, although streamlining of the liquidation process to reduce the liquidity costs seems highly desirable.

<sup>34</sup> See Securities Exchange Commission, *In the Matter of John E. Backlund et al.*, Rel. No. 33-7626 (Jan. 11, 1999), <http://www.sec.gov/litigation/admin/33-7626.txt>. A Federal Reserve policy change that abruptly raised short term interest rates reduced the valuation of money fund instruments generally. An additional factor in avoiding a run was that money market fund sponsors stepped up to provide support at 43 of the 963 then-registered MMFs. SEC 2013 Money Market Fund Reform Proposal, note 24 supra, 78 Fed. Reg. at 36840, Table 1.

<sup>35</sup> Economists sometimes refer to this as a “cash in the market” problem. Even if investors believe that particular assets are undervalued at today’s price, they will postpone buying if they also believe that tomorrow’s price will be even lower.

offer becomes necessary. Since the Fed has shown no desire to become lender of last resort to MMFs, loss-absorbing capital becomes the obvious alternative.<sup>36</sup>

The paper takes advantage of a natural experiment presented by European money market funds to provide empirical evidence on that run-risk question. Although all US MMFs are fixed NAV funds, money market funds offered in Europe come in both “stable NAV” and “accumulating NAV” varieties. A “stable NAV” fund is equivalent to the “fixed” US counterpart. An “accumulating” fund does not maintain fixed NAV, and while it does not fully “float,” it does offer a useful proxy for the effects of a “floating NAV” fund. We examined the performance of these European MMFs during Lehman Week to test the factors that contributed to run propensity. Although virtually all funds experienced a significant run, the only internal factor that consistently predicted extra run propensity in our various models was ex ante risk, proxied by reported yield before Lehman Week. By contrast, the difference in run propensity between stable and accumulating NAV funds was not economically or statistically significant. Focusing in particular on US dollar funds that provide the best institutional comparison, our point estimate is that a 1 percent increase in yield (e.g., from 2.00 percent to 2.02 percent) was associated with approximately a 0.6 percent decrease in fund assets (e.g., from \$100 million to \$99.4 million). Over the approximately 1.8 percent yield range of the USD European MMFs, this suggests that the highest yielding funds on average should have experienced asset contractions of approximately 24% greater than the lowest yielding

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<sup>36</sup> The industry apparently prefers the status quo. That would be roughly the result of adoption of the SEC’s proposal of optional liquidity fees and gates for fixed NAV funds. Investors have historically relied on sponsors’ implicit guarantees of MMF solvency. The SEC proposal would invite investors to rely upon sponsors’ implicit guarantee of MMF liquidity. See text accompanying notes – *infra*. Against the argument that a financial institution that engages in liquidity transformation without the backing of a creditworthy insurer, a lender of last resort, or loss-absorbing capital will present a systemic hazard, the industry response appears to be that, like it or not, the Federal Reserve will be obliged to support MMFs during a financial crisis. See Letter of John D. Hawke, SEC Authority to Address Threats to Money Market Mutual Funds or Related Market Disruptions, Aug. 17, 2012 (on behalf of Federated Investors) (as alternative to further SEC rule-making, first listing “the Federal Reserve’s authority and responsibility to provide liquidity to the markets”). For a discussion in which such Federal Reserve action would entail a subsidy to the industry, see the discussion of the mechanics of the AMLF at text accompanying 7-10 *supra* and note 13 *supra*.

There are many variants of loss-absorbing capital, including a proposal for the sale of bundled Class A/Class B units offered by one of the authors of this paper in August 2011 or a recent Federal Reserve staff proposal for a Minimum Balance at Risk Requirement that similarly calls for a hold-back for a period of time of a certain percentage of the investor’s deposit into the fund, with an additional subordination requirement for early-redeeming investors in the event of the fund’s liquidation. Compare Jeffrey N. Gordon, Comment Submitted to the Securities Exchange Commission, Aug. 12, 2011, <http://ssrn.com/abstract=2133588>, with Patrick McCabe et al., The Minimum Balance at Risk: A Proposal to Mitigate the Systemic Risk Posed by Money Market Funds, Fed. Res. Bd. Staff Rep. 564 (July 2012) [http://www.newyorkfed.org/research/staff\\_reports/sr564.html](http://www.newyorkfed.org/research/staff_reports/sr564.html). The FSOC’s November 2012 Proposed Recommendations, note 24 *supra*, included a Minimum Balance at Risk proposal.

funds. To repeat, none of the contraction was explained by the difference between stable and accumulating NAV, indicating that NAV “fixedness” did not contribute to the run.<sup>37</sup>

We also examine the performance of a subsample of USD funds held out as following the portfolio constraints of SEC Rule 2a-7, which makes for an even tighter comparison than the full universe of USD EMMFs. Ex ante risk was more strongly correlated with run risk during Lehman Week for this group of funds. Our point estimate is that a one percent increase in yield would explain an asset decrease of 2.85 percent. Among these funds, the reported yield varied from 2.12 to 2.72, which meant that the highest yielding funds should have experienced asset contraction loss of 31 percent more than the lowest yielding funds. The difference between stable NAV and accumulating NAV funds was, once again, insignificant.

In a sense these results should not be surprising. Although in theory a bank run can be triggered by an event uncorrelated with solvency risk (“sunspots”), the usual liquidity of MMF assets means that MMF runs are, instead, highly likely to be associated with correlated credit concerns about money market instruments.<sup>38</sup> Our conclusion is that floating NAV will not address the credit concerns associated with MMF assets.

Part I of this paper describes the prior literature on the MMF run during fall 2008. Part II describes European money market funds. Part III describes our data and provides descriptive statistics. Part IV provides our results. Part V concludes. Part V also provides a “policy coda” that discusses the current SEC proposals, focusing on the “fees/gates” proposal, and addresses the need for MMFs to develop the capacity to absorb loss apart from the implicit sponsor guarantees that now stabilize the industry.

## **Part I -- Prior Literature**

Post-2008 literature on money market funds tries to understand the factors that led to the MMF run by looking at various cross-sectional factors, such as yield, investor

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<sup>37</sup> On the debate as to whether bank runs are “panic driven” or are “information-based,” we find, “both.” Of the 19 percent contraction in USD European prime MMFs, roughly 16% of that run is explained by firm specific “information-based” factors in our models; the rest is driven by unobservables, probably meaning the external events. *Compare* Douglas W. Diamond & Philip H. Dybvig, Bank Runs, Deposit Insurance, and Liquidity, 91 J. Pol. Econ. 410 (1983) with Charles J. Jacklin & Sudipto Bhattacharya, Distinguishing Panics and Information-Based Bank Runs: Welfare and Policy Implications, 96 J. Pol. Econ. 568 (1988).

<sup>38</sup> The report of the industry’s Money Market Working Group is also instructive on this point. The Reserve Primary Fund was widely known to be “reaching for yield” in the effort to attract deposits. In the year before its failure, it significantly increased its holdings in higher yielding asset-backed commercial paper, giving it a meaningful yield advantage over its competitors (almost 50 basis points in February 2008). This strategy change moved the Reserve Fund’s yield from the bottom 20 percent of institutional MMFs into the top 10 percent. In the July 2007-September 2008 period, its assets and market share roughly doubled. Inv. Co. Institute, Report of the Money Market Working Group 53-57 (March 17, 2009).

characteristics, and sponsor characteristics of US-based MMFs. Because all US funds are of course fixed NAV, there is no cross-sectional variation on this dimension. We are aware of no prior study that looks that European MMFs in this regard.

McCabe (2011) finds that run propensity was increased by each of portfolio risk, proxied by average yield in the year prior to Lehman week; sponsor risk, proxied by credit default swap spreads; and investor risk, chiefly whether the fund was designed for institutional investors.<sup>39</sup> McCabe also finds that bank-affiliated sponsors exhibited lower run risk. Much the most powerful association is between the yield/risk variable and increased runs, in all specifications.

Wermers (2012) examines flows within and across complexes.<sup>40</sup> He finds correlation in run-levels for funds within a particular complex and finds that run-levels responded inversely to the liquidity of the fund's holdings. The pattern of flows suggests two things: first, that investors perceive negative externalities for the complex as a whole from risks associated with any particular fund within a complex, and second, runs are influenced by investor judgments about the sponsor rather than simply own-fund risks.

## **Part II – European Money Market Funds**

As of 2008, European money market funds operated under the general EU UCITS framework without a specific regulatory description or sanction.<sup>41</sup> A trade association, the Institutional Money Market Funds Association (“IMMFA”) created in 2000, established a voluntary regime in which triple-A rated MMFs could agree to adhere to a Code of Practice broadly based on SEC Rule 2a-7 as to portfolio composition and liquidity rules and various other conduct standards.<sup>42</sup> In general European MMFs are not

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<sup>39</sup> Patrick E. McCabe, *The Cross-Section of Money Market Fund Risks and Financial Crises*, Fed. Res. Bd Disc. Pap. 2010-51 (Sept. 2011), <http://ssrn.com/abstract=1898341>, at Tables 4, 5, 6

<sup>40</sup> Russ Wermers, *Runs on Money Market Mutual Funds* (June 2012), <http://ssrn.com/abstract=1784445>.

<sup>41</sup> For the then- existing UCITS framework (“Undertaking for Collective Investment in Transferable Securities”), see Committee on European Securities Regulation (“CESR”), *Consultation Paper, A Common Definition of European Money Market Funds* (Oct. 20, 2009), [http://www.esma.europa.eu/system/files/09\\_850.pdf](http://www.esma.europa.eu/system/files/09_850.pdf); Since then, the European Securities and Markets Authority (ESMA) (the successor to CESR) has developed a two-tier definition for MMFs, “short term MMFs,” and MMFs. The short-term vehicle provides for a maturity structure similar to current SEC Rule 2a-7 and quality and liquidity requirements similar to the Code of Practice of the Institutional Money Market Funds Association. ESMA (previously CESR) guideline reference CESR/10-049. See generally Viktoria Baklanova, *A Common Definition of European Money Market Funds: More Clarity or More Confusion?* (March 10, 2010), available at <http://ssrn.com/abstract=1568393>; Julie Ansider et al., *Money Market Funds in Europe and Financial Stability*, Eur. Systemic Risk Bd Occas. P. No. 1 (June 2012), available at [http://www.esrb.europa.eu/pub/pdf/occasional/20120622\\_occasional\\_paper.pdf?3388900a5331c7d3d74793ad3096cd6a](http://www.esrb.europa.eu/pub/pdf/occasional/20120622_occasional_paper.pdf?3388900a5331c7d3d74793ad3096cd6a).

<sup>42</sup> The IMMFA Code of Practice is available at <http://www.immfa.org/About/Codefinal.pdf> (visited July 8, 2012).

offered to US-domiciled investors. Unlike US funds, European MMFs come in “constant” NAV and “variable” NAV types. Constant NAV funds ordinarily use amortized cost accounting to value assets; Variable NAV funds use mark-to-market (or mark to model) to account for certain assets.<sup>43</sup>

Constant NAV funds in turn are provided in “stable” NAV and “accumulating” NAV varieties. Stable NAV funds purport to hold to fixed NAV. For these funds, dividends are paid out regularly, so that an investor’s increased credit balance is reflected in additional shares. Accumulating NAV funds purport to increase the value of NAV by retaining dividends, thus the value of the fund’s shares changes regularly over time.

Under the IMFFA Code of Practice, funds must monitor the difference between their published prices and mark-to-market valuations. For a stable value fund, if the market-valued NAV is less than 99.5 percent of the purported “constant” value, the fund is deemed to have suffered a “permanent loss of value,” which must be publicly reported. This would be equivalent to a US fund’s breaking the buck. For an accumulating value fund, such a “permanent loss” is realized and a similar notice required if the market value per share “falls below 99.5% of the highest level previously reached by the share price.”<sup>44</sup> The retention of dividends means that accumulating value funds should be able to absorb a greater gap between market valuation and nominal valuation before a reportable event.<sup>45</sup> The point is this: Although an accumulating fund does not regularly “float,” it does not maintain stable value. It is not a “fixed” NAV fund; investors do not focus on any particular value as the absolute measure of safety. Thus the comparison between stable and accumulating NAV funds provides a basis for testing whether it is the “fixedness” of NAV per se that promotes a run, rather than the underlying attributes of the fund’s assets or the value of a sponsor’s implicit guarantee.<sup>46</sup>

### **Part III – Data on European Money Market Fund.**

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<sup>43</sup> See Institutional Money Market Fund Ass’n Insights: Comparing CNAV and VNAV Funds (2010), available at <http://www.immfa.org/about/Insights.CNAVandVNAV.pdf>; ESMA (CESR) Guidelines Concerning Eligible Assets for Investment by UCITS, CESR/07-044b (March 2007) (guideline for section 4(2) of the UCITS Directive), available at [http://www.esma.europa.eu/system/files/07\\_044b.pdf](http://www.esma.europa.eu/system/files/07_044b.pdf). (VNAV funds may use amortized cost accounting for short term holdings).

<sup>44</sup> IMFFA Code of Practice ¶ 31 and n. 5.

<sup>45</sup> For example, the Fidelity Institutional Cash - USD fund had a September 12, 2008 share price of \$16,767.17 (highest in sample). Therefore, the fund would have needed to lose \$83.836 per share to constitute a reportable event.

<sup>46</sup> An alternative way to interpret our results: McCabe (2011) showed that “risk matters” for US money market funds in determining run rates. We replicate the results for European MMFs, despite different instruments, different sponsors, different users, and different salience of market activity. The “risk” in question is the default risk that MMFs take on, which can lead to fire sale risk within a specific fund and fire sale externalities for other funds.

Data on European MMFs is provided by iMoneynet, Offshore Money Market Fund Report (OMFR), which collects and publishes data on a weekly basis for a broad set of European MMFs that follow “some” of the SEC standards “for quality, maturity, and diversification.”<sup>47</sup> As we describe in more detail below, the OMFR universe is somewhat broader than the IMMFA subset. The OMFR provides information on portfolio assets class and composition, 30-day yield, expense ratio, minimum initial investment, and number of triple-A ratings by the credit rating agencies.

Using the OMFR data, Table 1 provides descriptive statistics on European MMFs as of September 2008 as well as data on asset contraction during Lehman week.<sup>48</sup> This data excludes funds that were 100 percent invested in government assets and thus is comparable to “prime” MMFs in the US.<sup>49</sup> European MMFs (“EMMFs”) are denominated in US dollars (“USD”), Euros, and pounds Sterling (“GBP”). As of September 12, 2008, the universe of 177 USD funds held assets of approximately \$373 billion, roughly 55 percent of the entire EMMFs sector. Euro funds, 120 in number, totaled approximately € 87 billion (\$123 billion). GBP funds, 117, totaled approximately £95 billion (\$170 billion).<sup>50</sup> By comparison, the “prime” funds in the US held assets in the period of approximately \$2.2 trillion.<sup>51</sup> Institutional prime funds, the relevant comparison for USD EMMFs, held assets of approximately \$1.4 trillion. Thus as of September 2008, USD EMMFs constituted over 20 percent of the worldwide market in USD institutional prime money market funds. The principal users of USD EMMFs are likely to be US multinationals that want to avoid the taxes associated with repatriation of USD earnings and other multinationals that receive payments in dollars.

For all currencies, stable NAV funds as a group were much larger than accumulating NAV funds. For example, total assets of stable USD funds were 12 times greater than total assets of accumulating NAV USD funds. The mean (median) fund size

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<sup>47</sup> See iMoney Net, Offshore Money Fund Report, <http://www.imoney.net.com/products-services/publications-subscriptions-offshore-money-fund-report.aspx>. The OMFR provides information only on constant NAV funds, not variable NAV funds. Constant NAV funds are commonly domiciled in Ireland and Luxembourg and used by international institutions, whereas variable NAV funds are domiciled elsewhere in Europe and used by domestic institutions. France is a major location for Variable NAV funds. See generally Julie Ansidei et al., Money Market Funds in Europe and Financial Stability, Eur. Syst. Risk Bd. Pap. No. 1 (June 2012). It appears that variable NAV funds are not commonly USD denominated.

<sup>48</sup> As noted in the prior footnote, these data are limited to constant NAV funds.

<sup>49</sup> The USD government EMMFs funds held approximately \$83.43 billion in assets on September 12, 2008. By comparison, US-based government MMFs held \$726 billion in assets at yearend 2007. We also excluded from these totals funds associated with Lehman Brothers because the special circumstances associated with their sponsor made those funds especially prone to run. The Lehman prime funds totaled USD \$8.2 billion; Euro € 1.49 billion; GBP .25 billion., and over Lehman week they contracted by 38.6%, 45%, and 41.5%, respectively.

<sup>50</sup> By contrast, the size of the on-shore US MMF industry in September 2008 was approximately \$3.5 trillion.

<sup>51</sup> Investment Company Institute Factbook, 2009. McCabe, Fig. 2B.

for USD stable NAV funds was \$2.6 billion (\$471 million); the mean (median) for USD accumulating NAV funds was \$717 million (\$134 million). Funds in other currencies were on average smaller and revealed somewhat different allocations between stable and accumulating NAV. Euro stable NAV funds as a group were only twice as large as accumulating NAV funds; GBP stable NAV funds as a group were nearly 30 times as large as GBP accumulating NAV.

Table 1 also provides information on EMMF run rates during “Lehman week,” Sept. 15-19, 2008, classified by currency and stable vs. accumulating NAV. We focus on Lehman week even though the asset contraction for US MMFs and EMMFs continued throughout September, because the immediate post-Lehman bankruptcy period best demonstrates the run potential in this form of financial intermediary. On Friday, September 19, the Treasury announced its MMF guarantee program and the Fed announced its AMLF program, which put a substantial break on redemptions.

[Insert Table 1 about here]

[Insert Table 2 about here]

As Table 1 indicates, during Lehman week USD funds experienced a significantly greater run (19.92 percent) than Euro funds (5.36 percent) or GBP funds (2.84 percent). Stable NAV funds ran at a different rate during Lehman week than accumulating NAV funds but the pattern is not consistent. USD and Euro stable NAV funds ran at a greater rate than their accumulating NAV counterparts. That pattern reversed itself for GBP funds. Similar patterns are seen in the more restricted data set of IMMFA funds in Table 2. On the basis of this univariate analysis, one might suppose that stable versus accumulating is an important explanatory variable. Yet, as Table 3 shows, there is significant cross-sectional variation in the run rates of both stable and accumulating funds, of similar dimension. Asset changes for both categories of fund vary from the highly negative for the “worst” 10 percent of funds (-42.6 percent for stable; -52.64 percent, accumulating) to the somewhat positive for the “best” 10 percent of funds (+7.9 percent for stable; +17.7 percent, accumulating).

[Insert Table 3 about here]

In a multivariate setting, the stable versus accumulating effect disappears, negligible in economic effect and not statistically significant. Instead, what stands out in our regression analysis are two measures of risk, portfolio risk, proxied by yield prior to Lehman week, and sponsor risk, proxied by a dummy for investment bank sponsor. By “risk,” we mean the chance that investors will suffer losses, whether directly through portfolio effects, or through a sponsor’s failure to protect its fund against losses, that is a

“default” on the implicit guarantee that was common in the industry. In using yield as a proxy for portfolio risk, we accept the common understanding that competitive conditions in money markets make it highly unlikely that any particular MMF can generate superior risk-adjusted returns.

For “yield,” we used the 30-day reported net yield, rather than gross yield, because net yield is commonly regarded as the measure of interest to investors. For example, the SEC “yield” that is reported for all US MMFs is a net yield figure. Further analysis of the “yield” variable reveals that EMMFs function in separate currency-based markets. Figure 1, a histogram of yields for all EMMFs, shows a bi-modal distribution. Upon further inspection, this turns out to be the result of separate distributions for (low) USD MMF yields, Figure 2, and for (high) Euro MMF yields, Figure 3, plus (higher) GBP MMF yields, Figure 4. In turn, the interest rate clusters seem to be the result of government monetary policy. For example, on September 12, 2008, the USD Federal Funds rate was 2.25 percent<sup>52</sup> and the GBP London Interbank Offer Rate was 5.05 percent.<sup>53</sup> The mean USD MMF yield in the period was 2.28 percent; the mean GBP MMF yield was 5.47 percent.

[Insert Figures 1, 2, 3, and 4 about here.]

Table 4 reports the yield distributions for the respective currencies. USD funds had the widest interest rate spread between the means yields for the top 10 percent and bottom 10 percent of funds (1.26 percent); GBP funds, the lowest (0.68 percent). USD funds also showed the greatest variation in their yields. Figure 5 is a scatterplot of yields and fund size for USD funds, which indicates that the largest funds were achieving the highest yields. Figure 6 is a scatterplot of yields and asset changes for USD funds, which suggests that higher yielding funds experienced greater asset contraction.

[Insert Table 4 and Figures 5 and 6 about here]

#### **Part IV -- Econometric Model and Results**

Our econometric analysis is limited to USD EMMFs on the view that these funds provide the closest EMMF comparison to US-based MMFs and thus the sharpest form of the natural experiment to test whether the “fixedness” of NAV affects run propensity. The contagion effects of the Reserve Primary Fund’s breaking of the buck should be greatest for USD EMMFs since (i) the USD instruments held by such funds trade and are priced in a single market and (ii) asset revaluations because of fire sales to meet redemption requests are the most likely vector for further buck-breaking. In this regard it

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<sup>52</sup> <http://www.newyorkfed.org/markets/statistics/dlyrates/fedrate.html>.

<sup>53</sup> <http://www.global-rates.com/interest-rates/libor/british-pound-sterling/2008.aspx>

is notable that asset contraction for USD EMMFs and US-based institutional MMFs was approximately the same (around 20 percent), much higher than asset contraction for Euro EMMFs (7 percent) or GBP EMMFs (3 percent).

## **1. Variables.**

Prior work by McCabe (2011) showed that cross-sectional differences among sources of risk produced different run rates for U.S. MMFs. The risks he identified were portfolio risk, sponsor risk, and investor risk. He found that portfolio risk, proxied by yield, and sponsor risk, proxied by CDS spreads, explain a significant amount of cross-sectional run variation. We engage in a similar analysis with somewhat different proxies for portfolio risk and sponsor risk and with the addition of another variable of cross-sectional variation, namely, stable vs. accumulating NAV. Like McCabe, we find that portfolio risk and sponsor risk are explanators of run differences; we also find that the stable vs. accumulating variable makes no difference. In McCabe's analysis, investor risk turns out to map onto institutional vs. retail ownership, which is not an element of cross-sectional variation for EMMFs, since they are generally held by institutions.

We look at four distinct variables to proxy for portfolio risk. First is 30-day net yield, in log transformation for tractability in interpreting results ("Yield"). Second is the likely issuer of the money market instruments held in the portfolio, proxied by the proportion of particular types of instrument held by the MMF. Our hypothesis was that the form of the instrument might indicate the type of issuer, and we could detect cross-sectional variation in default risk conditional on issuer type. So: "Repo," a financial services issuer; time deposits ("Time Deposits"), a bank issuer; certificates of deposit ("CDs"), a bank issuer; and commercial paper ("CP"), perhaps a non-financial issuer (or, alternatively, an asset-backed commercial paper issuer). The third proxy for portfolio risk is the credit rating of the particular MMF, linearly scaled in by the number of top ratings received. Like McCabe, we find that this variable has no explanatory effect and we omit it from the models we report on here. Fourth is the proportion of the portfolio invested in government securities, broken into Treasuries and other government instruments such as GSE debt ("Government Other"), which should improve liquidity for a given level of yield and thus reduce portfolio risk associated with fire-sale valuations.

The likely impact of yield on the run on USD MMFs is evidenced by the scatterplot histograms of Figure 5, which visually depicts an positive relation between yields and asset contraction (meaning: the higher the yield, the greater the asset contraction.)

We look at four variables to proxy for sponsor risk. Sponsor risk is important because of the practice of sponsors to protect their funds against the risk of falling NAV by replacing suspect securities with stronger ones, by providing liquidity puts as necessary at par or other sorts of guarantees. Sponsor support gained salience in the 2007 asset-backed commercial paper crisis in light of more than 40 such interventions.<sup>54</sup> A “weak” sponsor is less likely to have the financial capacity or willingness to provide such assistance and thus its sponsored funds may exhibit high run rates. One proxy for sponsor risk is whether the sponsor is a “too big to fail” bank (i.e., the initial TARP recipients) backstopped by a lender of last resort (the Federal Reserve); the expected effect is positive (“Bank Sponsor”). Another proxy is whether the sponsor is an investment bank, with presumptively limited financial capacity for large scale rescues, as demonstrated by Bear Stearns’ cutting loose two hedge funds in August 2007; the expected effect is negative (“iBank Sponsor”). A third proxy is the expense ratio, on the view that sponsors will have stronger economic incentives to support a more profitable fund (“Expense Ratio”). A fourth proxy is fund size, on the view that bigger funds will be more diversified, thus less exposed to single issuer default,<sup>55</sup> and will be more profitable for the sponsor, given the economies of scale in investment advisory activity; following customary scaling practice, this variable is logged (“Fund Size”). The hypothesized sign is positive.<sup>56</sup> Lehman-sponsored funds experienced unusually high asset contraction, 40 percent on average. To avoid biasing the results, we excluded these funds from the universe used in main model, but include these funds in a different model with a Lehman dummy.

Our dependent variable measures the extent of asset contraction over Lehman week, expressed as logged net asset change.<sup>57</sup> McCabe (2011), by contrast, evaluates MMF asset levels over a four week period. As noted above, on Friday of Lehman week the Treasury and the Federal Reserve announced separate policy interventions that substantially moderated the rate of prime MMF outflows in the following weeks; for example, a contraction of 19 percent during Lehman week vs. 7 percent in the week following. Lehman week most sharply presents the MMF run dynamics that we want to investigate.

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<sup>54</sup> See Securities Exchange Commission, Money Market Reform Proposed Rule, 74 Fed. Reg. 32688, 32691 n 38 (July 8, 2009); Moody’s Investor Service, Sponsor Support Key to Money Market Funds (August 9, 2010) .

<sup>55</sup> The Reserve Primary Fund, one of the largest funds at \$60 billion, is not necessarily to the contrary, since its size had doubled over the prior year in response to its significant increase in yield. We do not have data on fund size change and yield change over a prior period, which could be a useful risk proxy.

<sup>56</sup> On the other hand, size may be positively correlated with risk, since “reaching for yield” may have brought in more assets. See Figure 6. This is how the Reserve Primary Fund grew so rapidly over the 2007-08 period. Because of the high correlation between size and yield (.2946) , our model may be unable to tease out the separate effect of size.

<sup>57</sup> The log form reflects proportional changes without the risk of skew from the use of variable like “percent change” that has unlimited upside but capped downside.

Thus we report results for this model:

$$NetChange^i = \beta_1 stable^i + \beta_2 Size^i + \beta_3 Yield^i + \beta_4 Repo^i + \beta_5 TimeDeposits^i + \beta_6 CDs^i + \beta_7 CP^i + \beta_8 Treasury^i + \beta_9 GovernmentOther^i + \beta_{10} iBankSponsor^i + \beta_{11} BankSponsor^i + \beta_{12} ExpenseRatio^i + constant + \varepsilon^i$$

## 2. Results

Our main results are reported in summary form in Table 5a, col. 1 and with more detail in Table 5b, col.1. Only two variables are statistically significant, both with a negative sign, and both are economically significant as well: Yield (that is, net yield for the immediately prior 30-day period), which is a portfolio risk proxy; and the Investment Bank Sponsor dummy, a sponsor risk proxy. Since “Yield” is logged, the coefficient represents the percent change in fund assets for a one percent increase in yield. So, for example, for a 1 percent in interest rates (for example, an increase from 2.00 percent to 2.02 percent), the model predicts an asset contraction of 0.59 percent ( $t = -3.1$ ). Over the approximately 1.8 percent yield range of the USD European MMFs, this suggests that the highest yielding funds on average should have experienced asset contractions of approximately 24 percent more than the lowest yielding funds. To repeat, none of the contraction was explained by the difference between accumulating and stable NAV.

We also find that funds sponsored by investment banks contracted at a 24 percent higher rate than other funds, meaning that if the average fund contracted by 20 percent, say, an investment-bank sponsored fund would have contracted by approximately 25 percent ( $t=2.8$ ). After the failures of Bear and Lehman, investors were obviously wary of investment banks as a source of strength to their sponsored funds. We separately report on a model that includes Lehman Brothers funds, which shows that Lehman-sponsored funds contracted approximately 110 percent more than fund average, meaning, to follow the previous example, by 42 percent ( $t=6.0$ ). Table 5, col. 2; Table 5a, col 2. These results indicate that investors are strongly sensitive to comparative sponsor strength, perhaps as a sponsor class. That is, the failures of Bear and Lehman externalized to other investment bank sponsors as a class.

We ran the basic model using data restricted to IMMFA-member funds, on the view that these funds, by design, most closely followed the same rulebook as US-based MMFs. The previously observed patterns held up, indeed, were strengthened, as shown in Table 5a col. 3, Table 5b, col 3. Yield provided an even stronger explanation of differences in asset contraction across funds. For each 1 percent increase in yield (from 2.0 to 2.02 percent, for example), the model predicts an asset contraction of

approximately 2.9 percent ( $t=2.8$ ). Among these funds, the reported yield varied from 2.12 to 2.72, which meant that the highest yielding funds should have experienced asset contraction loss of 31 percent more than the lowest yielding funds.

*Insert Table 5a*

*Insert Table 5b*

### **3. Robustness checks**

Our models indicate that cross-sectional variation in run rates among USD European MMFs are not explained by the difference between stable NAV or accumulating NAV features. Although we control for differences such as size and yield across funds, there are some systematic differences between stable NAV and accumulating NAV funds that could perhaps bias the results. In particular, as shown in Tables 1 and 2, the average size of a stable NAV fund is larger than an accumulating NAV fund, and as Table 4 shows, the interest rate range for stable NAV funds is broader than for accumulating NAV funds.

Thus we have run separate regressions conditioned on size and yield. In particular, in these regressions we have restricted the data to areas of overlap. In the case of size, this means comparing stable and accumulating funds of less than \$4 billion on Sept. 12, 2008 (which eliminates large stable NAV funds). For yield, we compare funds with yields clustered within the same range (which eliminates high-yielding and low-yielding stable NAV funds).<sup>58</sup>

Table 5a (Table 5b) reports that the variables Yield and Investment Bank Sponsor remain economically and statistically significantly when each restriction is separately applied and remain of comparable magnitude (or greater) to the unrestricted model. (Table 5a, cols. 4, 5; Table 5b, cols. 4, 5). When the restrictions are applied simultaneously, Yield remains economically and statistically significant, increasing in magnitude over the unrestricted model. Table 5, col. 6; Table 5a, col. 6). The value for Investment Bank Sponsor is of consistent magnitude and sign as prior models, but of only marginal statistical significance ( $\rho =$  approximately 0.15). The loss of statistical

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<sup>58</sup> The sample is restricted to the cluster of data surrounding the 2.5% yield level, as seen in Figures 7 and 8. The cluster represents approximately 62% of the stable NAV funds and 77% of the accumulating NAV funds, of the complete sample. We ran an unreported regression using a different yield restriction based on the full overlap, the common range reflected in Table 4, 1.12 percent to 2.73 percent. The results were qualitatively similar.

significance may result from the reduction in sample size in the double-restricted model, from 169 to 89.

Not all sponsors have both stable and accumulating NAV funds. Of 22 sponsors identified in Table 6, which represents approximately 95 percent of the EMMFs in our sample, half offer funds with only one NAV variant. To control for the possibility of unobserved differences between such sponsors, we run a regression that restricts the sample to funds of sponsors that offer both kinds. Yield remains of comparable magnitude to the original model and remains statistically significant. Table 5a, col. 7; Table 5b, col. 7. Investment Bank Sponsor loses statistical significance (and is diminished in magnitude), perhaps because of the exclusion of Merrill Lynch, which sponsored only stable NAV funds. We also ran a “triple restriction” regression, combining the restrictions of size, yield, and sponsors that offered both stable and accumulating NAV. Although Yield is economically significant (and of much higher magnitude than in the original model), it is only marginally statistically significant ( $t = -1.63$ ,  $\rho = .10$ ), Table 5a, col 8; Table 5b, col. 8. This may be because the triple restriction model reduces the sample size by almost two-thirds,  $N=167$  v.  $N=63$ .

Thus throughout these robustness checks, Yield retains its decided explanatory power despite the restrictions and the reduction of sample size. In most specifications Investment Bank sponsor also retains explanatory power.

### **Part V – A Conclusion (And a Policy Coda)**

This paper contributes empirical evidence to the theoretical case that floating NAV will not address the systemic stability issues associated with money market mutual funds. Dollar-denominated European MMFs that were designed to be equivalent in almost all respects to US-based MMFs except that their NAV was not “fixed” ran at the same rate as fixed NAV funds. The run rate was affected by two other internally-determined risk factors: the yield of the fund and the likely sponsor capacity to support the fund against loss either from default on a portfolio security or from fire sale realizations on disposition of portfolio securities. Funds that had “reached for yield” experienced greater asset contraction. Funds sponsored by investment banks – whose fragility was demonstrated by Lehman’s failure – also experienced greater runs. But yield was the economically more significant and more robust explainer of run rate than sponsor risk.

Our paper confirms McCabe (2011) that both yield and sponsor factors contribute to run risk for MMFs. These findings underscore one important feature that has sometimes been missing from the current MMF policy debate: MMFs hold risky assets

in their portfolio; as such, MMFs are exposed to default risk. The first report of Treasury's Office of Financial Research underscores the extent to which most MMFs are at risk of breaking the buck upon the failure of a single significant issuer.<sup>59</sup> But note: if given the choice, many investors favor funds that offer the higher yields that come with taking additional risk.<sup>60</sup> This gives sponsors an incentive to pursue yield (and thus to take risks) since profits are sharply increasing in assets under management.<sup>61</sup> Sponsors do not, however, internalize the risks to *other* sponsors' funds that may arise from such risk-taking, much less general systemic risks. Investors are aware of fund-specific risks, are aware as well of relative risks, and at moments of financial distress will react accordingly. These risks threaten the stability of individual MMFs and, depending on the circumstances, threaten systemic stability more broadly.

MMFs, like other financial intermediaries (including but not limited to banks) that extend credit engage in a three-way credit transformation: risk transformation, maturity transformation and liquidity transformation.<sup>62</sup> They present two sorts of risk: solvency risk arising from default on portfolio assets and liquidity risk arising from the possible need to convert portfolio assets into cash to meet redemption requests. The 2010 SEC reforms attempted to address both of these risks, first by tightening the credit quality requirements for MMF assets and second by reducing the extent of MMF liquidity transformation by requiring MMFs to hold higher levels of cash and cash-equivalents and by shortening the maturity of portfolio assets. These are unlikely to enhance systemic stability by much, if at all. First, as demonstrated by the rapid unraveling of the asset commercial paper market in 2007-08, the perception of what counts as a "highest quality security" can rapidly change. At the time of purchase, Lehman Brothers paper had the highest investment grade; asset-backed commercial paper was similarly highly rated.

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<sup>59</sup> US Treasury, Office of Financial Research, 2012 Annual Report, 71-72, including Chart 3.3.11. OFR was established and tasked by Sections 153, 154 of the Dodd-Frank Wall Street Reform and Consumer Protection Act. As a concrete example, a recent Moody's analysis showed that 15 MMFs held positions in Lehman Brother securities, ranging from 0.25% of assets to 5.6% of assets, that could have resulted in such funds' breaking the buck in fall 2008. See McCabe et al, note xx supra, at 29.

<sup>60</sup> David S. Scharfstein, Perspectives on Money Market Mutual Fund Reforms, Testimony before the Senate Comm. on Banking, Housing & Urban Affairs (June 21, 2012), Exhibit 3 (showing asset growth of more than 50% for high yield funds relative to low yield funds over August 2007-August 2008 period ); Macrin Kacperczyk & Philipp Schnabl, How Safe are Money Market Funds? Stern School NYU & NBER W.P. (April 2012) <http://ssrn.com/abstract=1769025> (empirically demonstrating strong "flow-performance effect").

<sup>61</sup> This because costs, largely fixed, increase slowly in size, while income, geared to a fixed percentage of assets under management, increases linearly. Profit margins are thus increasing in size.

<sup>62</sup> Roughly, this means that banks convert short-term funds supplied by parties wanting safety and immediate 100 percent availability into credit assets that individually may carry significant default risk, that may remain outstanding for a significant time period, and that whose immediate sale price could well be substantially below the "hold to maturity" value.

Second, increased liquidity is a double-edged sword. As average maturities shorten, the pool of potential MMF fund users will shrink. What non-financial firm can feasibly finance its activities with repo financing? As we have already observed, the composition of MMF debtors has shifted from non-financial firms to financial firms. As increased liquidity requirements reduce the capacity of MMFs to engage in maturity transformation, other financial firms (or entities such as securitization vehicles) will step into the breach. MMFs will end up holding wholesale short-term credit claims on these other financial firms (entities), which in turn engage in maturity transformation. This will create two sorts of systemic risk: First, the financial industry concentration will present more highly correlated solvency risk for MMF portfolios. As argued above, this kind of correlated risk can convert an individual fund's loss into a run against MMFs generally. Second, as financial sector solvency risk increases, MMFs will protectively refuse to rollover financing for financial firms. This itself will create systemic distress.

The key to mitigating the systemic risks of MMFs lies through increasing their capacity to bear losses that may arise both from defaults on portfolio assets and from forced revaluation of portfolio assets in light of changing market conditions, particularly in a scenario in which other funds dispose of assets quickly to meet redemption requests. Even with loss absorbency capacity, MMFs, like every other financial intermediary, will face some run risk. The present set-up, however, in which MMFs have no capacity to bear loss on any portfolio security, puts MMFs on a knife edge. Assuming that a government program like deposit insurance is not feasible, there are three potential private strategies: first, third party guarantees; second, a loss-bearing layer in the capital structure; and third, a contingent loss-bearing layer, as through limits on redemption.

Until the financial crisis, the MMF industry achieved stability through implicit sponsors' guarantees, the first strategy. There is an admirable history of sponsors coming to the rescue of their sponsored funds, particularly in 2007 and 2008. Yet the failure of the Reserve Primary Fund shows the limit of that strategy. Nothing in the SEC's MMF rulebook matches fund size to sponsor financial capacity, yet as both McCabe (2011) and we show, at moments of systemic distress, sponsor capacity is an important factor in investor behavior. Indeed, for funds that needed sponsor support 2008, Moody's reported that at least 20 sponsors of fixed NAV funds in the US and Europe supplied \$12.1 billion, ranging from \$27 million to \$2.9 billion, an average of \$607 million per firm.<sup>63</sup> A careful study by the Boston Fed documented 31 instances between 2007 and 2011 in which prime MMFs would have broken the buck without sponsor support consisting of cash subvention.<sup>64</sup> Another careful study by Federal Reserve Board staff using a different

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<sup>63</sup> Moody's Investor Service, Sponsor Support Key to Money Market Funds (Aug. 9, 2010).

<sup>64</sup> Seffanie A. Brady, Ken E. Anadu & Nathaniel Cooper, The Stability of Prime Money Market Mutual Funds: Sponsor Support from 2007 to 2011, Fed. Res. Bank of Boston (Aug. 13, 2012), <http://www.bos.frb.org/bankinfo/qau/wp/2012/qau1203.pdf>. The Boston Fed study, based on SEC Form

methodology that broadens the definition of sponsor support to include guarantees shows that 29 funds would have broken the buck in the month following the Lehman failure without sponsor support.<sup>65</sup> Yet because we do not and realistically could not require a sponsor to guarantee its funds, the current practice of sponsor support (unless and until it is not feasible), is a treacherous ice floe on which to rest a multi-trillion dollar financial intermediary.<sup>66</sup>

The second strategy is to require MMFs to create a loss-absorbing layer in the capital structure, for example, through a distinct class of equity. This could be done through sponsored-supplied capital as a condition of offering and maintaining a MMF, through the sale of capital to third parties, or through imposition of capital costs on the users of MMFs. User-capital could come through retained earnings, namely, the withholding of some interest that would otherwise be paid (not a feasible strategy in the present low interest rate environment), or through requiring a mutual fund investor to buy an allotment of risk-bearing capital as a condition for using the particular MMF.<sup>67</sup>

The third strategy, contingent loss-bearing through redemption restrictions, focuses on the run-risk problem in the absence of default. The Lehman Week run took hold despite the absence of wide-spread defaults on other money market instruments. But

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N-CSR (Certified Shareholder Report of Registered Management Investment Companies ) makes conservative assumptions about the nature of sponsor support, including cash infusions and purchases of securities at above market price, for example, but excluding sponsor guarantees or cases in which sponsors supplied liquidity but asserted the acquired positions did not result in a loss. Most of the instances of sponsor support were the result of defaults or other market devaluations occurring during 2007 and 2009, but in many cases the immediate losses were avoided by guarantees that resulted in actual payouts only later in the 2007-2011 period. On 21 occasions, the support was greater 0.5% of assets under management, meaning, greater than the break-the-buck threshold; for an additional 10 cases, the aggregate of sponsor support exceed 0.5% of assets under management.

<sup>65</sup> See Patrick E. McCabe, Marco Cipriani, Mochael Holscher & Antoine Martin, *The Minimum Balance at Risk: A Proposal to Mitigate the Systemic Risks Posed by Money Market Funds*, Fed. Res. Bd. D.P. 2012, at 31 (using reports required under the Treasury's Temporary Guarantee Program for Money Market Funds), <http://www.federalreserve.gov/pubs/feds/2012/201247/201247pap.pdf>.

<sup>66</sup> For example, one of the largest US MMF sponsors, Federated Investors, Inc., managed, as of yearend 2011, approximately \$370 billion in assets, including \$242 million in MMF assets, of which \$110 billion were prime MMF assets, representing nearly 8 percent of all prime MMF assets. Federated Investors, Inc 2011 Annual Report, at 5, 8, 14; Inv. Co. Institute 2011 Factbook, at 164, Table 37. As of yearend 2011, Federated reported \$50 million in cash and cash equivalents, "available for sale" equity securities of \$160 million, and receivables, which together totaled approximately \$345 million. These liquid holdings included investments in Federated money market funds, \$118 million. On most favorable assumptions, then, its liquid assets were 0.31% of prime MMF assets. Federated also had a \$200 million credit revolver. Assuming immediate and complete availability, this brings Federated's liquid resources up to 0.5% of prime MMF assets. Federated 2011 Annual Report at 19, 52, 37. See also Federated Investors Inc., Form 10-Q, June 30, 2012 (Management Discussion and Analysis of Liquidity). How much support could such a sponsor provide to its funds at crunch time, not just to cover losses but to supply liquidity to avoid a loss-making sale? This is not to pick on Federated. Other asset managers with large MMFs like Vanguard and Fidelity are not public firms and do not disclosure such information.

<sup>67</sup> One such approach is described in Jeffrey N. Gordon, Comment Submitted to the Securities Exchange Commission, Aug. 12, 2011. See note 28 supra.

given the valuation uncertainty following Reserve Primary Fund's breaking the buck, MMF investors faced a classic prisoner's dilemma game in which the rational individual strategy was to "redeem," rather than "not redeem" despite the collective irrationality of such a strategy. "Redeeming" meant a higher chance of receiving par than "not redeeming" and never would make the redeeming investor worse off. From the MMF side, the need to generate cash to meet actual and anticipated redemption requests meant that MMFs could receive depressed "fire sale" prices on sound assets, which itself could lead to wide-spread MMF losses and thus bad investor outcomes. This "run" dynamic can be reversed, however, by the simple expedient of restricting the extent to which investors can fully redeem all of their shares in a short time frame, for example, by delaying redemption of  $x$  percent of an investor's MMF stake for  $y$  days.<sup>68</sup> This makes all investors residual risk bearers in event of losses associated with a run – there are no first mover advantages to running -- and should reverse the run dynamics. Such a "holdback" means that in most circumstances an individual investor's best chance to avoid loss is from *not* running. Because MMF users are made to internalize some of the costs of runs, the incidence of runs will decrease. This in turn increases the systemic stability of MMFs.<sup>69</sup>

### *The Current SEC Proposal*

As noted above, the two inescapable facts about prime money market funds are first, that they hold "risky" assets, meaning, assets with a possibility of default; and second, they have no internal capacity to recoup the losses from a portfolio default or the sale of a security at less than par. Interest or dividends earned may not be retained, since

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<sup>68</sup> According to press accounts, such a redemption "hold-back" is one of the alternatives in the SEC draft reform proposal. For worked-out alternatives, compare Jeffrey N. Gordon, Comment Submitted to the Securities Exchange Commission, Aug. 12, 2011, available at <http://ssrn.com/abstract=2133588> with Patrick McCabe et al., The Minimum Balance at Risk: A Proposal to Mitigate the Systemic Risk Posed by Money Market Funds, Fed. Res. Bd. Staff Rep. 564 (July 2012), available at [http://www.newyorkfed.org/research/staff\\_reports/sr564.html](http://www.newyorkfed.org/research/staff_reports/sr564.html). The McCabe et al proposal further strengthens the anti-run dynamics by subordinating the held-back portion of redeeming investors to non-redeeming investors.

<sup>69</sup> Note that the industry-favored solution, a Liquidity Facility, addresses liquidity risk only, not solvency risk. See Investment Co. Institute Comment to the SEC, Jan 10, 2011, available at [http://www.ici.org/pdf/11\\_sec\\_pwg\\_com.pdf](http://www.ici.org/pdf/11_sec_pwg_com.pdf), at 23-31. The proposal is for industry capitalization of a state bank that would belong to the Federal Reserve System and that would accordingly have access to the Fed's discount window, on a contemplated leverage ratio of 20-1. In a crisis, this Liquidity Facility would buy MMF portfolio securities at par. The ICI proposal contemplates that within 10 years the Liquidity Facility could generate \$50-55 billion in support. The proposal shows the weakness of a private lender-of-last-resort solution and its ultimate dependence on the Fed's support. First, the Facility may be inadequate for its purpose; during fall 2008, for example, the AMLF bought \$150 billion in ABCP. This inadequacy may itself be a source of instability. Second, on a 20-1 leverage ratio, this would mean that the Liquidity Facility would have less than \$3 billion in capital to cover potential losses. As with the AMLF, to provide meaningful support to the industry, the Fed would end up bearing significant credit risk without customary central bank protections. See note 13 supra.

an MMF, like other mutual funds, is a flow-through vehicle. Until the financial crisis of 2007-09, MMFs had been protected against loss by implicit sponsor guarantees, reflected in the widespread sponsor practice of swapping out defaulted or value-depressed securities.<sup>70</sup> Our examination of the European money market confirms McCabe (2011) that MMFs differ in their credit risk and that run rates are increasing in such risks. Higher-risk funds impose risks for lower-risk funds, because their greater rate of asset dispositions at times of financial stress may affect asset valuations of all funds.<sup>71</sup>

The SEC has offered two main proposals.<sup>72</sup> The first, for floating NAV for institutional funds, provides a mechanism for MMFs to realize loss and, through the price mechanism, is meant to remind investors of the credit risks they bear.<sup>73</sup> We have discussed at length the run risks associated with floating NAV.

The second SEC proposal, retaining fixed NAV, would permit MMFs to impose a liquidity fee of up to two percent and to suspend (or “gate”) investor redemptions for up to 30 days, if the fund’s liquidity falls below a particular threshold, namely, if the fund’s “weekly liquid assets” fall below 15 percent of its total assets.<sup>74</sup> The liquidity fee is designed to have many of the incentive properties of a holdback proposal: by imposing losses on redeeming shareholders that are greater than the likely losses of remaining pat, it will discourage runs.<sup>75</sup> The gate is designed to staunch a run should the liquidity fees prove insufficient.<sup>76</sup>

In our view the SEC proposals are inadequate to assure stability for MMFS and will encourage continued reliance on implicit sponsor guarantees with the prospect of a Federal Reserve bailout in the background. The optionality in the SEC proposals undercut their effect. Although the SEC states that the falling below 15 percent liquidity threshold “would require” an MMF to impose a liquidity fee, it permits an option: “unless

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<sup>70</sup> See SEC 2013 Money Market Fund Reform Proposal, note 24 supra, 78 Fed. Reg. at 36840, Table 1.

<sup>71</sup> Indeed, as the financial crisis demonstrated, higher quality assets may be more quickly sold and may suffer greater apparent market depreciation than lower quality assets, precisely because the higher quality assets are more liquid.

<sup>72</sup> See generally See SEC 2013 Money Market Fund Reform Proposal, note 24 supra, 78 Fed. Reg. 36834 et seq. The SEC proposals also include greater diversification requirements, more stress testing, and enhanced disclosure for MMFs. Investment advisors for certain unregistered “liquidity funds” would be required to disclose information to the SEC.

<sup>73</sup> Retail funds, categorized by a \$1 million cap on daily redemption, and government funds, categorized by the requirement to maintain at least 80 percent of all assets in U.S. Treasuries, agencies, or short term issuances collateralized by such securities, would be permitted to retain fixed NAV.

<sup>74</sup> “Weekly liquid assets” refers to assets that will mature in less than a week.

<sup>75</sup> See SEC 2013 Money Market Fund Reform Proposal, note 24 supra, 78 Fed. Reg. at 36887 (“We are not proposing to allow fund boards to impose a larger liquidity fee than 2% because we understand that, even in “fire sales” or other crisis situations, money market funds typically have not realized haircuts greater than 2%...”)

<sup>76</sup> The SEC also has invited comment on a proposal that combines proposals one and two, that is, allows the imposition of liquidity fees and gates for floating institutional MMFs.

the fund's board determines that it is not in the best interest of the fund.”<sup>77</sup> Obviously it would disserve the reputational interest of the fund and the fund sponsor to impose a liquidity fee, for the same reasons that sponsors have frequently swapped out defaulted or depressed value securities. Investors want a product with safety and liquidity; the sponsor's reputation stands behind those expectations. In a time of financial stress, investors will expect free redeemability, as before. If default on a portfolio security leads a fund to break the buck (or come close), that could precipitate not only a fund-specific run but pressure on other funds as well, through run dynamics we have previously described. Should one or more funds deny redeemability, impose a gate, that will exacerbate the redemption pressure at other funds.

“Gating” a fund would be like suspending convertibility at a bank: a depositor would be deprived of immediate access to its funds. Given that MMFs are a cash management tool for institutional users, slamming down the convertibility window could have disruptive effects on the real economy. A single fund's decision to gate could dramatically increase redemption pressures at other funds. As in fall 2008, the threat of massive dislocation in the MMF sector, particularly if non-financial firms face the risk of being cut off from their cash, will bring immense pressure on the Federal Reserve to produce facilities like the Asset-Backed Commercial Paper MMF Liquidity Facility, in which the Fed bears uncompensated credit risk.

The SEC's optional fees/gates proposal disserves systemic stability because it does not establish clear expectations about loss realizations and loss absorption. It invites investors to play a timing game, in which they have incentives to monitor liquidity thresholds, sponsor incentives, other investors' behavior, and to move funds abruptly. Unlike an automatic holdback, which necessarily provides a disincentive to run, an optional liquidity fee may not. In contrast to the SEC's fees/gates proposal, an alternative (like the FSOC's Minimum Balance at Risk proposal) that establishes a mechanism for loss-sharing and a mandatory holdback sets forth rules of the game that conduce to systemic stability.

#### *And in Sum*

MMFs assemble diversified portfolios of credit-screened money market instruments. In their present fixed-NAV form MMFs play a useful transactional role as a bank substitute, especially for large institutions with large cash balances that exceed the limits of deposit insurance guarantees.<sup>78</sup> In light of applicable accounting and tax

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<sup>77</sup> Id. at 36834.

<sup>78</sup> Dodd-Frank temporarily removed the ceiling on deposit insurance but the \$250,000 ceiling returned on January 1, 2013. This had led to increased inflows into MMFs.

conventions, fixed NAV enhances the functional usefulness of MMFs. This increases the fraction of institutions' cash balance kept in MMFs as opposed to the banking system, most probably on deposit with large money center banks. Some have argued that the deposit substitutes provided by MMFs reduce systemic risk in the financial system by reducing the size of “too big to fail” banks.

Our paper sheds light on the question of whether fixed NAV itself is a significant source of systemic instability associated with MMFs – an inherent flaw in the mechanism – or whether the systemic problem lies elsewhere. In our view systemic stability depends on the capacity to absorb loss, not fixed NAV. On the other hand, we see no problem with a regulatory approach that conditions use of fixed NAV on provision of such loss-absorbing capacity. Stability of the financial system is a public good that cannot be sustained in the presence of pervasive free-riding. If MMFs are an efficient alternative to banks from the users' perspective, then the MMF structure can bear such costs.

**Table 1:***OMFR Percentage Change by Money Market Fund Type and Denomination during the Run*

<b>Category</b>	<b>Funds Count</b>	<b>Total Assets 9/12/08 (Mil)</b>	<b>Total Assets 9/19/08 (Mil)</b>	<b>% Change 9/12/08 to 9/19/08</b>	<b>9/12/08 Mean/ Median / Std. Dev.</b>
<b>USD STABLE NAV</b>	135	\$342,769.0	\$272,609.5	<b>(20.47%)</b>	<b>\$2593.62/ \$470.95/ \$6655.93</b>
<b>USD ACCUMULATING NAV</b>	42	\$30,573.7	\$26,361.3	<b>(13.78%)</b>	<b>\$716.99/ \$134/ \$1369.49</b>
<b>EURO STABLE NAV</b>	79	€ 60,131.8	€ 55,515.0	<b>(7.68%)</b>	<b>€804.81/ €283.5/ €1444.4</b>
<b>EURO ACCUMULATING NAV</b>	41	€ 27,226.0	€ 27,161.4	<b>(0.24%)</b>	<b>€732.75/ €117.1/ €1661.92</b>
<b>STERLING STABLE NAV (Pounds)</b>	87	£92,074.3	£89,540.8	<b>(2.75%)</b>	<b>£1133.98/ £200.7/ £2175.83</b>
<b>STERLING ACCUMULATING NAV (Pounds)</b>	30	£3,417.9	£3,235.8	<b>(5.33%)</b>	<b>£125.49/ £78.4/ £127.08</b>

**Table 2:***IMMFA Report Percentage Change by Money Market Fund Type and Denomination during the Run*

<b>Category</b>	<b>Funds Count</b>	<b>Total Assets 9/12/08 (Mil)</b>	<b>Total Assets 9/19/08 (Mil)</b>	<b>% Change 9/12/08 to 9/19/08</b>	<b>9/12/08 Mean/ Median / Std. Dev.</b>
<b>USD STABLE NAV</b>	24	\$268,122.1	\$206,276.8	<b>(23.07%)</b>	<b>\$11,414.07/ \$4,689.2/ \$16,643.08</b>
<b>USD ACCUMULATING NAV</b>	16	\$25,064.4	\$20,992.9	<b>(16.24%)</b>	<b>\$1,496.89/ \$178.9/ \$3,091.72</b>
<b>EURO STABLE NAV</b>	24	€ 56,605.2	€ 51,941.1	<b>(8.24%)</b>	<b>€2,400.83/ €1,567.0/ €2,678.69</b>
<b>EURO ACCUMULATING NAV</b>	17	€ 26,584.2	€ 26,584.3	<b>0.00%</b>	<b>€1,654.38/ €214.85/ €2,815.06</b>
<b>STERLING STABLE NAV (Pounds)</b>	23	£91,135.4	£88,622.9	<b>(2.76%)</b>	<b>£4,132.43/ £3,172.9/ £4,178.08</b>
<b>STERLING ACCUMULATING NAV (Pounds)</b>	14	£3,124.7	£2,949.3	<b>(5.61%)</b>	<b>£238.08/ £136.1/ £206.49</b>

**Table 3:**  
USD EMMFs Size and Asset Contraction Distribution (OMFR)

<b>Size on 9/12 by fund</b>	<b>Stable</b>	<b>Accumulating</b>
10%	\$13.4	\$11.3
50% (Median)	\$462.8	\$96.1
90%	\$6,519.4	\$2,383.8
<b>Asset Contraction 9/12-9/19 by fund</b>		
10%	(42.6%)	(52.64%)
50% (Median)	(9.06%)	(3.6%)
90%	7.9%	14.7%

**Table 4:**  
*Yields for European Money Market Funds (OMFR)*

	<b>N</b>	<b>Mean</b>	<b>Min</b>	<b>Max</b>	<b>S.D.</b>	<b>Mean lowest 10%</b>	<b>Mean highest 10%</b>	<b>10% -90% spread</b>
<b>USD</b>	173	2.28	1.12	2.91	.396	1.45	2.71	1.26
<b>USD Stable</b>	134	2.26	1.12	2.91	.425			
<b>USD Accum</b>	39	2.34	1.31	2.73	.265			
<b>EURO</b>	110	4.59	3.33	5.02	.255	4.07	4.92	.85
<b>EURO Stable</b>	73	4.61	3.33	4.95	.245			
<b>EURO Accum</b>	37	4.56	3.49	5.02	.275			
<b>GBP</b>	108	5.47	4.9	5.82	.202	5.75	5.07	.68
<b>GBP Stable</b>	81	5.49	4.9	5.82	.198			
<b>GBP Accum</b>	27	5.41	5.01	5.72	.208			

**Table 5a:***Regression Results Summary*

Dependent variable is the logged net change in USD EMMF assets over Lehman week, Sept. 15-19, 2008. Independent variables are potential proxies for portfolio risk and sponsor risk. "Stable" reflects a dummy variable for whether the fund is a stable NAV or accumulating NAV fund. "Size" is the log of assets as of Sept. 12, 2008. "Yield" is the log of 30-day net yield for the period immediately prior to Lehman week. "Repo," "Time Deposits," "CDs," "CP," "Treasury" and "Government Other" reflect the share of MMF portfolio assets in the particular class of instrument. "iBank Sponsor," "Bank Sponsor" and "Lehman" are dummies for sponsor type.

Table 5a reports coefficients only. Starred coefficients represent statistically significant results ( $p \leq .05$ ). Table 5b reports all results. Coefficient is on top; standard error is in the middle; t-statistics is on the bottom.

	(1)	(2)	(3)	(4)
Stable	-.0511	-.0931	.0432	-.0444
Size	.0064	.0368*	.0030	.0082
Yield	-.589*	-.667*	-2.855*	-.5726*
Repo	.0033	.0042	-.0023	.0034
Time Deposits	.0037	.0042	-.0043	.0041
CDs	-.0015	-.0013	.001	-.0014
CP	.0026	.0032	-.0033	.0031
Treasury	.0065	.0067	-	.0219
Government Other	-.0049	-.0033	-.0289	-.0087
iBank Sponsor	-.2392*	-.28*	-.4067*	-.2212*
Bank Sponsor	.0523	.0269	-.0038	.0623
Expense Ratio	.0053	.032	-	.0050
Lehman	-	-1.12*	-	-
Constant	.1939	.1311	2.67*	.1451
N	169	177	38	148
R-squared	.1629	.3646	.4673	.1748
Adjusted R-squared	.0985	.3139	.2699	.1014
	(5)	(6)	(7)	(8)
Stable	.0031	.0199	.0041	.0465
Size	.0077	.0026	-.0034	-.0249
Yield	-2.503*	-2.49*	-.7624*	-3.445
Repo	.0070	.0074	.0017	.0123
Time Deposits	.0075	.0079	.0017	.0076
CDs	.0027	.0026	-.0031	-.0016
CP	.0096	.0102	.0016	.0122
Treasury	.0025	.0191	.0019	.0189
Government Other	.0023	-.0025	-.0058	.0036
iBank Sponsor	-.3045*	-.2381	-.1984	-.2396
Bank Sponsor	.1079	.1248	.0803	.2812
Expense Ratio	-.1227	-.1392	-.0066	-.2574
Constant	1.17	1.11	.4511	1.834
N	107	89	106	63
R-squared	.2130	.2187	.1768	.2294
Adjusted R-squared	.1126	.0954	.0706	.0444

**Table 5b:**  
*Regression Results*

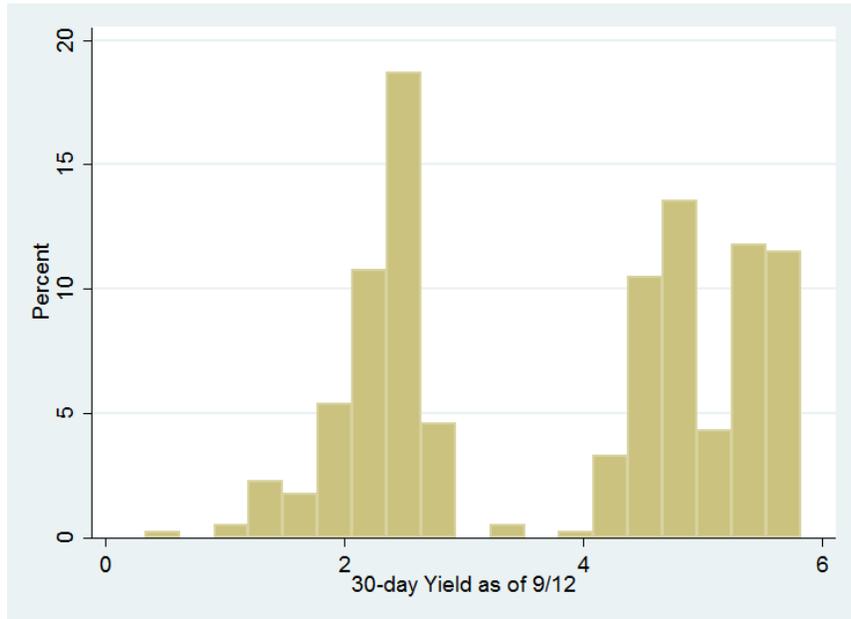
	(1)	(2)	(3)	(4)
Stable	-.0511 (.067) ((-0.77))	-.0931 (.086) ((-1.09))	.0432 (.106) ((0.41))	-.0444 (.071) ((-0.63))
Size	.0064 (.014) ((0.62))	.0368* (.017) ((2.18))	.0030 (.026) ((0.12))	.0082 (.017) ((0.48))
Yield	-.589* (.189) ((-3.12))	-.667* (.249) ((-2.68))	-2.855* (.995) ((-2.81))	-.5726* (.2) ((-2.86))
Repo	.0033 (.004) ((0.89))	.0042 (.005) ((0.87))	-.0023 (.011) ((-0.21))	.0034 (.004) ((0.86))
Time Deposits	.0037 (.003) ((1.17))	.0042 (.004) ((1.01))	-.0043 (.01) ((-0.45))	.0041 (.003) ((1.20))
CDs	-.0015 (.003) ((-0.50))	-.0013 (.004) ((-0.33))	.001 (.007) ((0.14))	-.0014 (.003) ((-0.45))
CP	.0026 (.003) ((0.78))	.0032 (.004) ((0.73))	-.0033 (.008) ((-0.41))	.0031 (.004) ((0.88))
Treasury	.0065 (.013) ((0.49))	.0067 (.017) ((0.38))	-	.0219 (.018) ((1.25))
Government Other	-.0049 (.008) ((-0.65))	-.0033 (.010) ((-0.33))	-.0289 (.016) ((-1.77))	-.0087 (.009) ((-1.01))
iBank Sponsor	-.2392* (.085) ((-2.83))	-.28* (.112) ((-2.51))	-.4067* (.157) ((-2.59))	-.2212* (.093) ((-2.31))
Bank Sponsor	.0523 (.065) ((0.80))	.0269 (.086) ((0.31))	-.0038 (.139) ((-0.03))	.0623 (.072) ((0.87))
Expense Ratio	.0053 (.025) ((0.21))	.032 (.033) ((0.97))	-	.0050 (.027) ((0.19))
Lehman	-	-1.12* (.186) ((-6.02))	-	-
Constant	.1939 (.331) ((0.59))	.1311 (.436) ((0.30))	2.67* (1.28) ((2.09))	.1451 (.365) ((0.40))
N	169	177	38	148
R-squared	.1629	.3646	.4673	.1748
Adjusted R-squared	.0985	.3139	.2699	.1014

	(5)	(6)	(7)	(8)
Stable	.0031 (.089) ((0.03))	.0199 (.099) ((0.20))	.0041 (.082) ((0.05))	.0465 (.115) ((0.40))
Size	.0077 (.020) ((0.38))	.0026 (.029) ((0.09))	-.0034 (.019) ((-0.18))	-.0249 (.036) ((-0.68))
Yield	-2.503* (1.08) ((-2.32))	-2.49* (1.24) ((-2.01))	-.7624* (.308) ((-2.47))	-3.445 (2.12) ((-1.63))
Repo	.0070 (.009) ((0.91))	.0074 (.01) ((0.74))	.0017 (.009) ((0.20))	.0123 (.015) ((0.82))
Time Deposits	.0075 (.007) ((1.12))	.0079 (.008) ((1.04))	.0017 (.006) ((0.30))	.0076 (.011) ((0.70))
CDs	.0027 (.006) ((0.50))	.0026 (.006) ((0.41))	-.0031 (.004) ((-0.70))	-.0016 (.008) ((-0.21))
CP	.0096 (.006) ((1.62))	.0102 (.007) ((1.51))	.0016 (.006) ((0.27))	.0122 (.011) ((1.13))
Treasury	.0025 (.016) ((0.15))	.0191 (.025) ((0.77))	.0019 (.015) ((0.12))	.0189 (.025) ((0.74))
Government Other	.0023 (.012) ((0.20))	-.0025 (.014) ((-0.18))	-.0058 (.014) ((-0.41))	.0036 (.023) ((0.16))
iBank Sponsor	-.3045* (.141) ((-2.15))	-.2381 (.169) ((-1.41))	-.1984 (.119) ((-1.66))	-.2396 (.19) ((-1.26))
Bank Sponsor	.1079 (.108) ((1.00))	.1248 (.123) ((1.01))	.0803 (.161) ((0.50))	.2812 (.249) ((1.13))
Expense Ratio	-.1227 (.08) ((-1.55))	-.1392 (.096) ((-1.46))	-.0066 (.028) ((-0.24))	-.2574 (.166) ((-1.55))
Constant	1.17 (1.01) ((1.15))	1.11 (1.17) ((0.95))	.4511 (.546) ((0.83))	1.834 (1.51) ((1.22))
N	107	89	106	63
R-squared	.2130	.2187	.1768	.2294
Adjusted R-squared	.1126	.0954	.0706	.0444

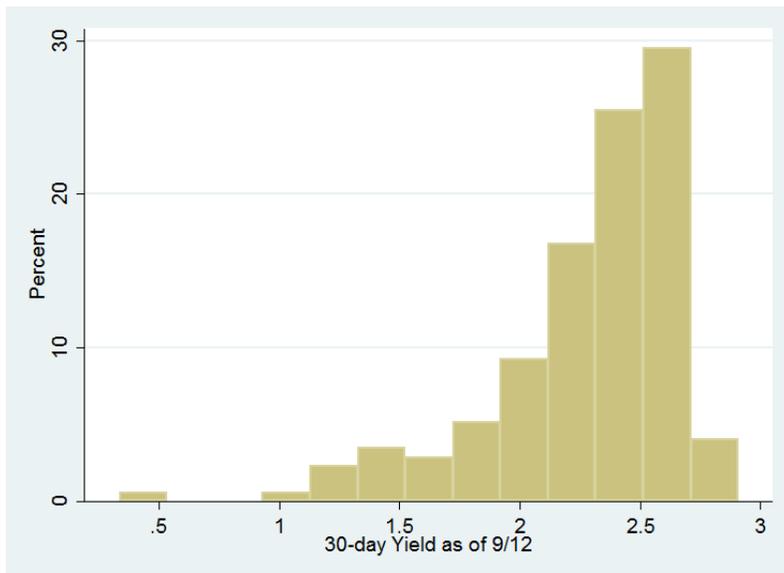
**Table 6:***Sponsors for USD EMMFs (OMFR)*

Sponsor	N. Stable	N. Accum	Average Assets	Min Assets	Max Assets	Std. Dev. Assets	Cum. Assets	% of Total	Avg. Yield	Min Yield	Max Yield	Std. Dev. Yield
JPM	10	4	6,596.94	122.3	43,910.6	11,444.54	<b>92,357.2</b>	24.74%	2.43	1.92	2.73	0.2481
Goldman Sachs	5	3	6,044.69	27.2	40,195.8	13,903.94	<b>48,357.5</b>	12.95%	2.31	2.17	2.42	0.0986
Citi	6	2	6,036.78	42.5	36,581.8	12,577.47	<b>48,294.2</b>	12.94%	2.52	2.35	2.67	0.1279
HSBC	5	3	3,735.49	21.1	19,209.0	6,399.22	<b>29,883.9</b>	8.00%	2.35	2.01	2.57	0.1727
Bank of New York Mellon	9	1	2,597.72	91.6	9,667.6	3,521.78	<b>25,977.2</b>	6.96%	2.38	1.85	2.61	0.2389
Morgan Stanley	5	6	1,555.36	11.9	15,615.8	4,666.19	<b>17,108.9</b>	4.58%	2.17	1.31	2.61	0.4594
Barclays	4	0	3,499.57	91.3	12,174.5	5,795.34	<b>13,998.3</b>	3.75%	2.52	2.31	2.63	0.1455
State Street	5	1	2,243.48	16.4	12,691.9	5,121.33	<b>13,460.9</b>	3.61%	2.46	2.1	2.67	0.2031
Black Rock	5	1	2,034.60	46.5	6,628.2	2,493.26	<b>12,207.6</b>	3.27%	2.51	2.14	2.72	0.1937
Federated	4	1	1,316.12	5.9	4,280.1	1,818.02	<b>6,580.6</b>	1.76%	2.19	1.66	2.48	0.3372
Investco AIM	6	1	789.96	11.3	3,171.9	1,089.46	<b>5,529.7</b>	1.48%	2.261	1.61	2.53	0.3389
Deutsche Bank	4	0	1,368.30	208.1	3,134.4	1,255.09	<b>5,473.2</b>	1.47%	2.48	2.04	2.71	0.3006
Fidelity	4	3	689.20	8.8	2,371.2	938.28	<b>4,824.4</b>	1.29%	2.62	2.43	2.84	0.146
Western Asset	5	0	937.38	3.3	4,669.3	2,086.21	<b>4,686.9</b>	1.26%	1.73	1.33	1.97	0.3134
Butterfield	0	3	1,474.57	13.0	2,383.8	1,275.27	<b>4,423.7</b>	1.18%	2.1	1.9	2.25	0.1803
RBS	1	0	4,092.40	-	-	-	<b>4,092.4</b>	1.10%	2.59	-	-	-
Northwestern Mutual Life	2	0	1,765.95	511.3	3,020.6	1,774.34	<b>3,531.9</b>	.95%	2.835	2.76	2.91	0.1061
Merrill Lynch	5	0	701.08	216.0	2,122.7	807.75	<b>3,505.4</b>	.94%	1.36	1.12	1.65	0.2199
Northern Trust	4	0	803.48	12.8	1,724.4	703.17	<b>3,213.9</b>	.86%	2.31	2.22	2.42	0.0846
Reich & Tang Asset Management	5	0	583.54	232.5	854.8	235.37	<b>2,917.7</b>	.78%	2.09	1.77	2.6	0.3683
Bank of America	6	0	345.57	1.8	1,335.1	493.78	<b>2,419.0</b>	.65%	2.39	1.99	2.69	0.2275
BNP Paribas	0	4	432.83	36.9	1,305.1	432.83	<b>1,731.3</b>	.46%	2.41	2.07	2.65	0.2636

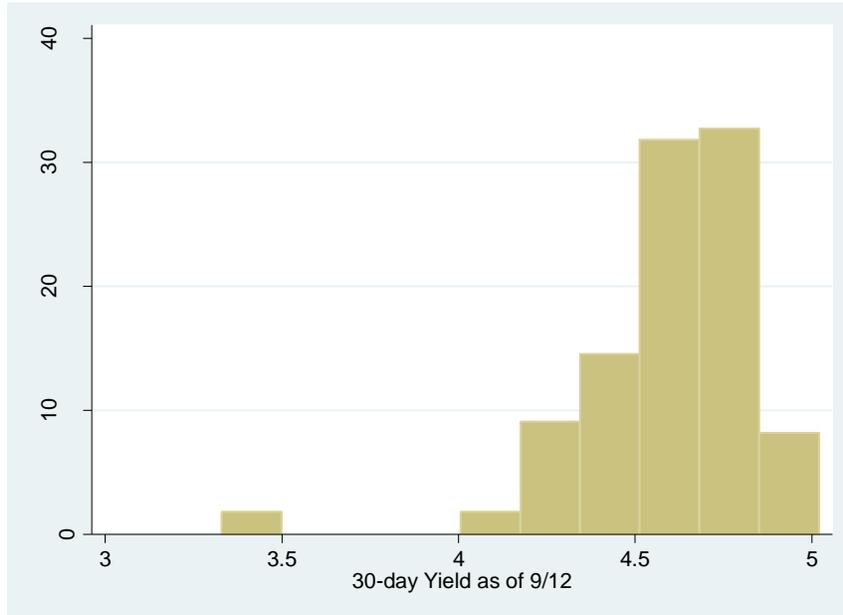
**Figure 1**  
*Histogram of EMMF Yields*



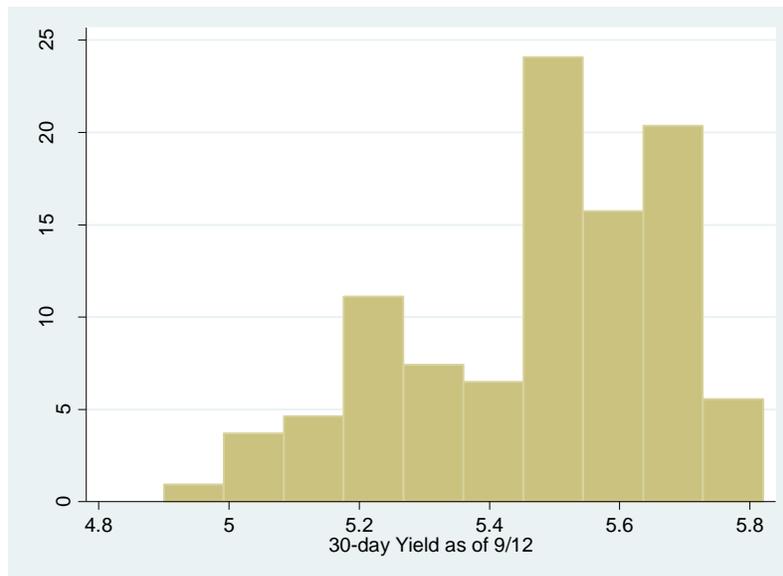
**Figure 2:**  
*Histogram USD EMMF Yields*



**Figure 3:**  
*Histogram EURO EMMF Yields*

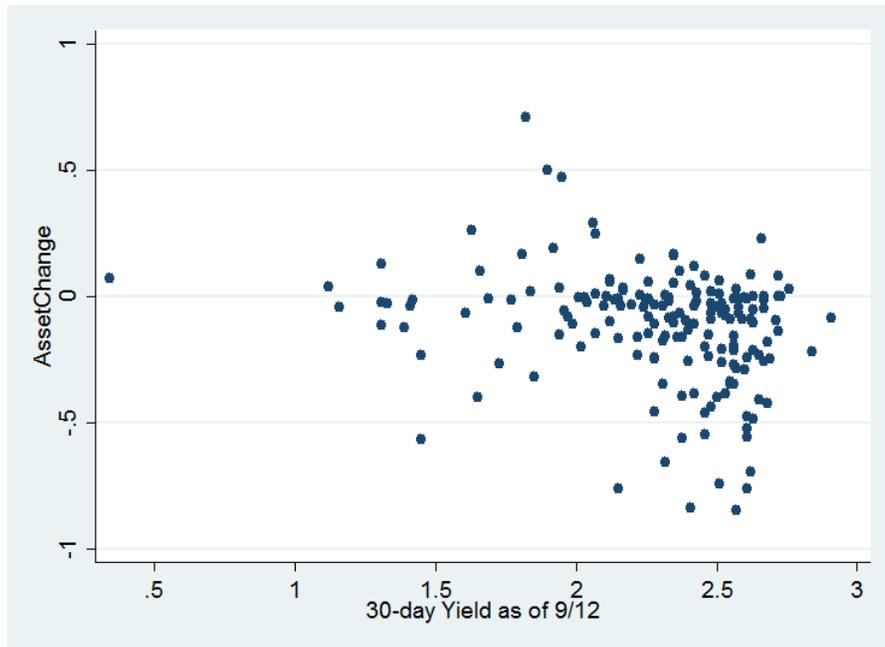


**Figure 4:**  
*Histogram GBP EMMF Yields*



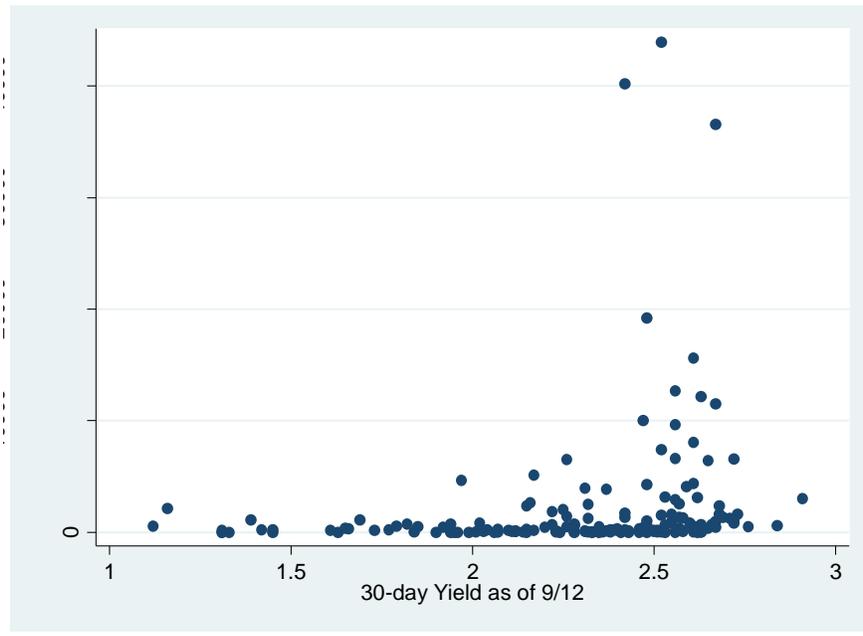
**Figure 5:**

*Scatter Plot: USD EMMF Yield by Percent Change in Assets*

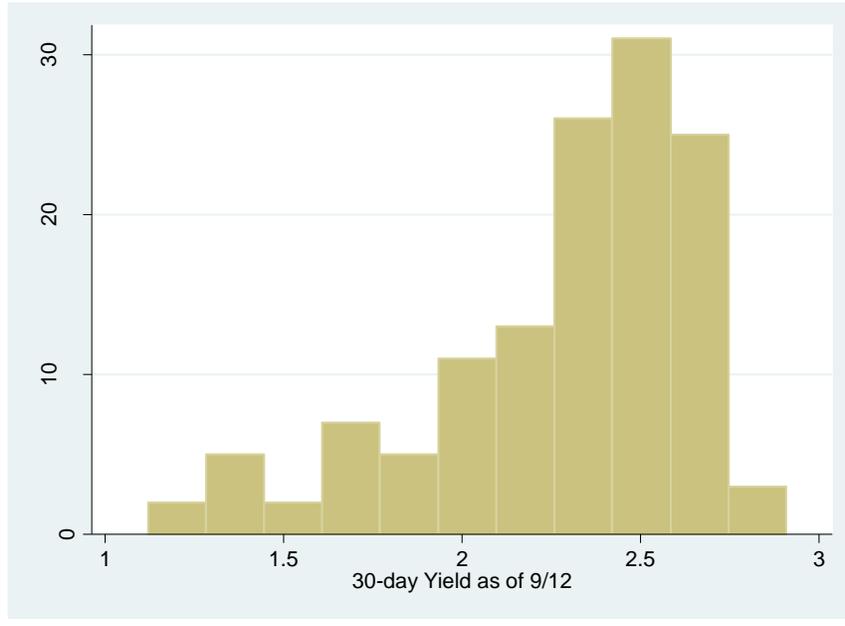


**Figure 6:**

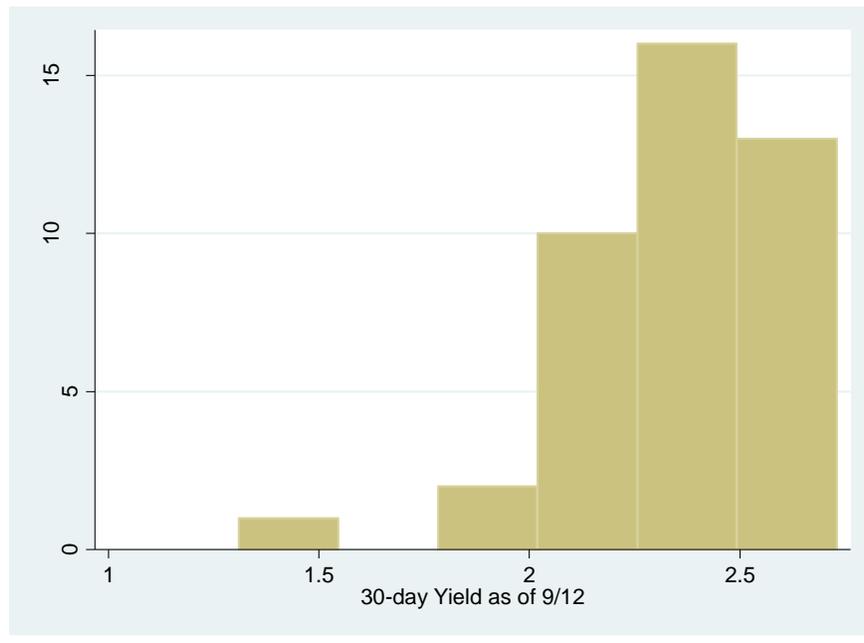
*Scatter Plot: USD EMMF Yield by Assets*



**Figure 7:**  
*Histogram Stable USD EMMFs Yields*



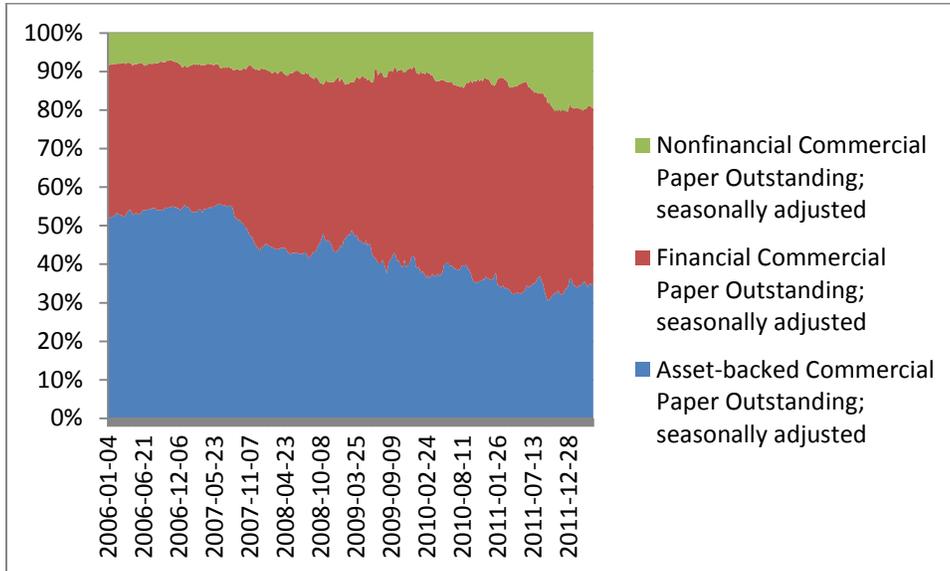
**Figure 8:**  
*Histogram Accumulating USD EMMFs Yields*



# Appendix 1: Commercial Paper Composition

**Chart A:**

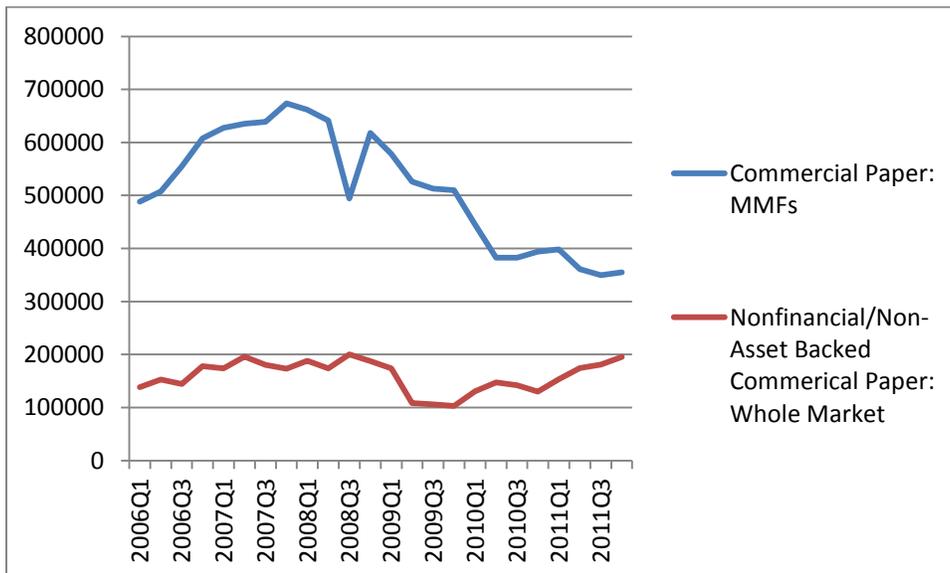
*Composition of Commercial Paper Market*



Source: Federal Reserve Board, Commercial Paper Release

**Chart B:**

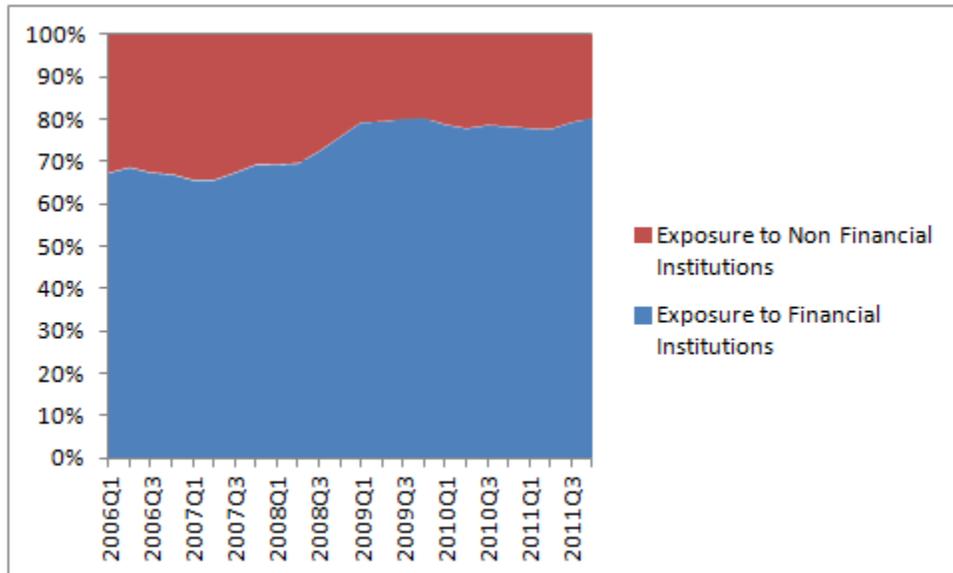
*MMF CP vs Nonfinancial CP on the Market*



Source: Federal Reserve Board, Commercial Paper Release and Flow of Funds

**Chart C:**

*MMF exposure to Financial Institutions*



Source: Federal Reserve Board, Commercial Paper Release and Flow of Funds