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Federal Liquidity Options: Containing Runs on Deposit- Like Assets without Bailouts and Moral Hazard

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In response to the 2008 runs on deposit-like assets, namely repo and money market funds, the Fed created new liquidity facilities for nonbanking institutions and the Treasury guaranteed certain money market fund balances. These extraordinary actions, while justified by officials as necessary to preserve the financial system, did rescue nonbanks by exposing the public to unprecedented risks.

Since 2008, despite legislation and regulation, deposit-like assets are still vulnerable to runs. The fallback policy to contain such runs is still *ad hoc* lending by the Fed. Bailouts, though officially outlawed, may very well be justified and used again. And, finally, because the implicit safety net of government action is still in place, moral hazard remains a feature of the financial landscape.

This paper proposes that the Fed auction Federal Liquidity Options (FLOs) as the exclusive means of providing liquidity to nonbanks in a crisis. Having issued FLOs that encompass a sufficient quantity and breadth of collateral, authorities will be able to claim, with credibility, that no additional emergency lending programs or bailouts will be required to safeguard the viability of solvent nonbanks. In the resulting policy regime, the Fed does not rescue individual firms or industries but fulfills its contractual obligations under options previously sold at market-determined prices. Furthermore, with the cost of contingent liquidity internalized by the purchasers of FLOs, and with other extraordinary provisions of liquidity credibly renounced, moral hazard will drop significantly.

I. Introduction and Summary

Central to the financial crisis in 2008 were runs on deposit-like assets, namely repurchase agreements and money market funds. With respect to repo, financial institutions found it difficult to borrow cash even when the safest and most liquid securities were offered as collateral. With respect to money market funds, investors abandoned funds that held commercial paper without waiting for indications that any particular fund was at risk.

The runs on these deposit-like assets threatened the viability of nonbanking financial institutions that relied on repo and commercial paper markets for funding. Fearing that the fallout could destabilize the financial system, officials at the Federal Reserve and the U.S. Treasury took unprecedented actions to provide liquidity to these borrowers and to stop the runs. Some actions taken were called “lending of last resort” while others were called “bailouts,” but particular programs do not necessarily fit neatly into either category. For the purposes of this paper, the purest form of lending of last resort is temporary lending to a broad group of solvent entities on good collateral. By contrast, the purest form of a bailout is infusing an insolvent entity with cash to keep it from failing.

While rescues of nonbanks through lending of last resort or bailouts may be the best policy choice from within the fog of a financial crisis, these policy actions always pose two major problems. First, they expose the public to risk or they cost the public money. This is particularly disagreeable when the beneficiaries of the rescues are perceived as being wealthy, politically connected, and having failed to manage their businesses responsibly. Second, lending of last resort and bailouts create moral hazard. Believing that authorities are likely to supply liquidity and other support in a crisis, market participants have less incentive to manage the risk of a tail event. For example, the extraordinary lending facilities introduced in response to the demise of Bear Stearns may have lulled investment banks into complacency about liquidity, leaving them vulnerable to the shock waves of the bankruptcy of Lehman Brothers. In any case, the moral hazard created by expectations of lending of last resort and bailouts increases the likelihood and severity of crises in the first place.

Legislation and regulation since 2008 have not eliminated the possibility of runs on deposit-like assets. Stricter regulation of the financial industry and new resolution authority may forestall some potential disasters. New political checks on lending of last resort and the official outlawing of bailouts may reduce the likelihood of such actions in future crises. But the ultimate policy fallback to handle nonbanks in financial distress is still *ad hoc* lending. Furthermore, with this fallback well understood, moral hazard is still very much a part of the financial landscape.

The experience of money market funds and repo in 2008 has generated several proposals to address the fault lines of these markets. One proposal is that money market funds convert to floating NAV. While this change may make money market funds less prone to runs, it is unlikely to make such runs extinct. Also, to the extent that this change drives investment from money market funds into less regulated deposit-like assets, here or abroad, runs might become more of a problem. A second proposal is that money market funds, because they have deposit-like liabilities, be regulated more like banks. This proposal, however, also fails to account for the phenomenal global demand for deposit-like assets. Altering money market funds so that they no longer satisfy this demand, because of changes to their structure or economics, will push investment elsewhere, in form or jurisdiction, and the next run may very well be on other, less-regulated forms of deposit-like assets.

A third proposal in light of the events of 2008 is to create private or public backstops for repo and money market funds. The general consensus, however, is against the creation of these backstops. They would be, almost by definition, too big to fail, thus exposing the public to the risk of these markets, and their existence would exacerbate moral hazard.

This paper proposes that the Fed auction Federal Liquidity Options (FLOs) as the exclusive means of providing liquidity to nonbanks in a crisis. Purchasers of these options would have the right to borrow from the Fed at a penalty rate on good and adequate collateral. Most importantly, the quantity and terms of outstanding FLOs, which determine the stock of collateral that could potentially be funded by the Fed in a crisis, must enable authorities to claim, with credibility, that no additional lending programs or bailouts will be necessary to safeguard the viability of solvent nonbanks. In this paper, this claim will be referred to as the “pledge of FLO exclusivity.” Based on the experience of 2008, the recommendation made here is to sell \$750 billion of FLOs that, upon exercise, permit borrowing against collateral currently accepted in the tri-party repo market.¹ Furthermore, establishing the FLO program by an act of Congress and having the Fed periodically recommend an outstanding quantity of FLOs to Congress for approval would establish the credibility of the new policy regime.

Providing liquidity through FLOs does not rescue individual firms or industries at the risk or expense of the public, but fulfills contractual obligations of options previously sold at market-determined prices. A clear line will have been drawn between solvent but illiquid nonbanks, defined as those that can borrow through the FLO program, and insolvent nonbanks, defined as those that cannot post FLO-eligible collateral or that do post such collateral but then fail to make subsequent margin calls. Furthermore, authorities will have the confidence and political will to let insolvent nonbanks fail because of the pre-established consensus that the liquidity available through the FLO program is sufficient to safeguard financial stability.

The existence of FLOs will facilitate the improvement of liquidity management at nonbanks. While liquidity managers will still have to make assumptions about the behavior, in a crisis, of private funders and investors (e.g., repo lenders, purchasers of commercial paper, money market fund shareholders), contingency plans can be anchored in the knowledge that the Fed, through FLOs, can be relied upon with certainty for a fixed quantity of liquidity at pre-arranged terms. In addition, FLO prices can be used to decide whether particular business ventures are truly profitable after adjusting for their liquidity requirements and costs.

The policy regime recommended here significantly reduces moral hazard. The credible pledge of FLO exclusivity makes it clear that nonbanks are completely responsible for tail liquidity risk. This clarity provides a strong incentive to improve liquidity risk management, along the lines of the previous paragraph, and, with the prices of FLOs as additional inputs, to internalize the cost of liquidity. Collectively, these responses will make risk-taking more societally efficient, thus reducing moral hazard. Behavior will have changed so as to reduce the probability and severity of a crisis in the first place.

Essentially, the FLO policy regime preserves the benefits of emergency lending by the central bank without undesirable rescues and the concomitant moral hazards.² Section II reviews the 2008 runs on repo and money market funds and the extraordinary responses of the Fed and U.S. Treasury. Section III presents the relevant legislative and regulatory developments since 2008, concluding that deposit-like assets are still susceptible to runs, bailouts are still possible, and *ad hoc* lending of last resort is still the fallback policy. Section IV explains why leading proposals for reform would fall short of changing these features of the *status quo*. Section V presents FLOs, describing how selling options appropriately

constructed and issued would enable the Fed to provide sufficient liquidity to nonbanks in a crisis at minimal risk to itself and without spawning unintended consequences. Section VI concludes.

II. Lending of Last-Resort and Bailouts in Response to Runs on Deposit-Like Assets in 2008

Repo and money market funds are deposit-like assets. They are like deposits because, in normal circumstances, investors can withdraw principal and interest essentially on demand.³ But they are unlike deposits because they are outside the banking system, that is, outside of banking regulation and deposit insurance.

This section describes the 2008 runs on repo and money market funds and the extraordinary governmental interventions that these runs engendered. The run on repo threatened the viability of investment banks that relied on repo to fund a significant portion of their assets. The run on money market funds made it difficult to sell commercial paper, which, in turn, threatened the viability of financial firms dependent on that source of funding. In response to these threats, the Fed created facilities that essentially gave primary dealers and commercial-paper issuers access to the discount window, and the U.S. Treasury created a guaranty program for money market funds.

a. Repo

In a run on repo, even borrowers who offer to post good collateral have trouble finding lenders. This can happen in times of financial stress for two reasons. First, lenders know that if they have to liquidate the collateral of a defaulting borrower, other secured lenders will have to do the same. This phenomenon, combined with generally turbulent market conditions, means that collateral sales may result in significantly lower proceeds than anticipated. Put another way, in stressed markets lenders become uncertain about how large haircuts need to be. Second, when markets are under stress, defaults are messy and lawsuits are likely to challenge the terms of collateral sales. In theory, repo lenders could charge a higher rate of interest to compensate for the time and expense of a potential lawsuit. In practice, however, the additional dollar revenue from any interest rate surcharge on an overnight loan is so small that repo lenders choose instead to forego lending to weaker counterparties.

Secured Funding through 2007 and Early 2008

The deterioration of the housing market and the ensuing concerns about the credit quality of financial institutions made secured funding more difficult to obtain throughout 2007 and early 2008. Lenders demanded higher repo haircuts, cut back on both the quantity and length of term agreements, and decreased or refused to increase credit lines. This tightening of secured funding markets hit mortgage-related assets and illiquid assets particularly hard, but—to the surprise of many market participants at the time—also impaired the financing of the safest and most liquid asset classes.

March 2008: the Collapse of Bear Stearns and the Creation of the PDCF and TSLF

In March 2008, Bear Stearns experienced a run of its secured lenders.⁴ The Fed extended credit to save the firm from bankruptcy and, concerned that deteriorating secured funding markets might threaten other financial institutions, created the Primary Dealer Credit Facility (PDCF) and the Term

Secured Lending Facility (TSLF). The PDCF created a discount window for primary dealers by enabling them to borrow from the Fed on a secured basis on a wide range of high-quality collateral.⁵ The TSLF enabled primary dealers to post a narrower range of top-quality collateral to the Fed for 28 days in exchange for Treasuries, which, in turn, could be more easily used as collateral to raise funds from private counterparties. The pre-announced quantities of Treasuries to be loaned through the TSLF were allocated across dealers by competitive auctions.⁶

The PDCF was carefully designed as a lender of last resort to primary dealers, that is, to encourage its use as a temporary source of funds in a system-wide liquidity crunch but to discourage its use by any borrower as a more permanent source of funds. First, the borrowing rate was set at a penalty rate, that is, at a rate above fed funds.⁷ Second, the Fed provided “guidance” to users of the PDCF. And third, each borrower was charged a facility usage fee that increased with the length of time the facility was used.⁸

Despite its design and marketing as a lender of last resort to primary dealers, the PDCF initially served as a means to bail out Bear Stearns. From March 2008 through the latter part of June, 72.5% of the facility’s loans were to Bear Stearns, and, from then until the bankruptcy of Lehman Brothers, the facility was essentially unused. Viewed from another perspective, the largest combined daily draw on the PDCF before the bankruptcy of Lehman Brothers, by all primary dealers excluding Bear Stearns, was a relatively small \$13.9 billion.⁹

Unlike the PDCF, the TSLF became operational too late to be of much use to Bear Stearns, but was used extensively by the remaining primary dealers. From its inception until the bankruptcy of Lehman Brothers, the TSLF swapped, on average, over \$100 billion market value of collateral. Usage peaked toward the end of April at over \$160 billion.¹⁰

The TSLF, despite the fact that it never disbursed funds, should be thought of as a lender of last resort. First, the TSLF enabled primary dealers to raise funds that might not otherwise have been available to them. Second, the risk to the Fed of swapping collateral through the TSLF is very similar to the risk of any secured lending program: the Fed will incur a loss should the borrower default at the same time that the collateral suffers a significant drop in value.¹¹ Furthermore, while significantly mitigated by appropriate haircuts, risk from the TSLF is “wrong-way” risk. In a financial crisis of sufficient magnitude to break primary dealers, “flight-to-quality” trades are likely to increase the value of Treasuries the Fed has loaned relative to the value of securities it has taken as collateral.

Moral Hazard from the PDCF and TSLF

There are reasons to believe that the PDCF and TSLF, as lenders of last resort, created moral hazard by dulling the incentives of primary dealers to reduce their funding risks. From the collapse of Bear Stearns to the bankruptcy of Lehman Brothers, primary dealers reduced their repo funding by only about 8% and did not reduce the ratio of overnight to term repo funding at all.¹² This response was—certainly in hindsight—woefully inadequate. Decision makers at primary dealers might very well have been lulled into complacency by the Fed’s actions. For example, Dick Fuld, Chairman and CEO of Lehman Brothers, within days of the announcement of the PDCF and TSLF, made a statement that the “Federal Reserve’s decision to create a lending facility for primary dealers and permit a broad range of investment-grade securities to serve as collateral improves the liquidity picture, and from my perspective, takes the liquidity issue for the entire industry off the table.”¹³

September 2008: the Bankruptcy of Lehman Brothers

With Lehman Brothers on the brink of bankruptcy, the Fed was concerned yet again about the robustness of funding markets. It expanded eligible collateral for the PDCF to include any collateral eligible in the tri-party repo system, which includes non-investment grade debt securities and equities, and expanded eligible collateral for the TSLF to include investment grade debt securities.¹⁴ Soon after, in the wake of Lehman Brothers' bankruptcy, both facilities fulfilled their functions as lenders of last resort to primary dealers. Borrowing from the PDCF mushroomed from zero to a peak of about \$156 billion by September 29 while collateral swaps through the TSLF jumped from their pre-Lehman average of a bit over \$100 billion to a peak of \$228 billion on September 25. Subsequently, as funding conditions normalized, PDCF borrowings fell accordingly, falling to \$79 billion by the end of October, to \$37 billion by year-end 2008, and to zero by mid-May 2009. Similarly, collateral swap volume through the TSLF, though volatile, averaged less than \$170 billion from October to the end of 2008 and then fell by roughly \$25 billion a month until essentially hitting zero in July 2009.¹⁵ The PDCF and TSLF were both closed by February 1, 2010.

b. Money Market Funds

In a run on a money market fund, investors withdraw their balances *en masse*. In a financial crisis, investors have an incentive to redeem before other investors—which is the dynamic that causes a run—for two reasons. First, a fund that has to liquidate assets quickly in order to meet redemptions, particularly in a crisis, will likely incur non-trivial liquidation costs. In other words, the proceeds from liquidating assets will fall short of amortized values and even of recently marked-to-market values of those assets. Therefore, shareholders who redeem before the liquidation receive payouts based on the relatively high, pre-liquidation values. By contrast, shareholders who redeem after liquidation bear all of the liquidation costs, including the costs incurred in the sales triggered by the early redeemers.

The second incentive to redeem early is due to the fixed net asset value (NAV) feature of money market funds. According to the rule that permits money market funds to mimic deposits, fund shares can be fixed at some value, usually \$1, despite small fluctuations in the value of the underlying portfolio, unless losses to that portfolio exceed .5%. Should that happen, the fund has to “break the buck” and revalue its shares at a lower, market-based value. Given the working of the fixed NAV structure, investors who fear that a fund's portfolio will suffer a non-trivial loss have an incentive to rush to redeem at \$1, that is, before the fund breaks the buck. Investors who are not nimble enough to redeem at \$1 have to bear the entire loss on the portfolio, including the loss on the shares redeemed before the fund broke the buck.

September 2008: the Reserve Primary Fund Breaks the Buck and Suspends Redemptions

On September 16, 2008, having written off its holdings of Lehman Brothers' commercial paper, the Reserve Primary Fund valued its fund shares at 97 cents on the dollar and suspended redemptions.¹⁶ The shock of a money market fund breaking the buck and suspending redemptions because of losses on commercial paper, combined with broader manifestations of financial stress at the time, precipitated a general run on prime money market funds. (Prime funds invest predominantly in non-government

securities.) Over the four weeks from September 10 to October 8, balances in these funds fell from \$2.15 trillion to \$1.70 trillion, i.e., by \$450 billion or 21%. This drop was massive relative to weekly balance fluctuations at a standard deviation of about \$20 billion per week.¹⁷ Furthermore, had many sponsors not elected to support their respective money market funds throughout this period, and had the U.S. Treasury not intervened in the manner described below, many funds other than the Reserve Primary Fund might have broken the buck and the drop in the industry's balances might have been even more severe.¹⁸

Since money market funds are significant investors in the commercial paper market—they held about 37% of all commercial paper outstanding at the end of June 2008¹⁹—the run just described dramatically reduced the extent to which proceeds from maturing commercial paper were rolled into newly issued paper. In fact, total commercial paper outstanding fell from \$1.76 trillion as of September 10 to a low of \$1.43 trillion by October 22, a drop of \$330 billion or about 19% over that six-week period. In addition, the increasing risk aversion of money fund managers and other investors reduced the maturities at which issuers could sell commercial paper. The percentage of paper issued with maturities from 1 to 4 days, for example, increased from an average of about 65% in the month before the bankruptcy of Lehman Brothers to over 80% in the month after the bankruptcy.²⁰

The Guaranty Program for Money Market Funds and the CPFF

The difficulties of rolling commercial paper borrowing in the wake of the run on prime money market funds raised concerns that solvent and otherwise viable entities would fail. Vulnerable borrowers included issuers of asset-backed securities, funding corporations (i.e., subsidiaries that borrow on behalf of financial entities), finance companies (which lend to businesses and individuals), and others. Note that nonfinancial borrowers were less of a concern at the time, constituting only 11% of the commercial paper market in 2008²¹ and only 6% of the fall in outstanding volume in the month following the bankruptcy of Lehman Brothers.²² In any case, in an effort to alleviate the liquidity pressures in the market, the U.S. Treasury and Federal Reserve took several unprecedented actions.

On September 19, 2008, the U.S. Treasury announced its Guaranty Program for Money Market Funds. In exchange for a fee of 1 or 1.5 basis points per quarter (depending on NAV), money market funds participating in the program would have their balances as of September 19 guaranteed for one year by the \$50 billion in the Treasury's Exchange Stabilization Fund.²³ Given the "virtually 100 percent market participation" of funds in the guaranty program, including government-only funds,²⁴ it is hard to argue that this was not a rescue or bailout of money market fund investors and fund managers. As it turned out, of course, the Treasury collected \$1.2 billion in fees from the program without incurring any losses.²⁵

While the Treasury's guaranty program addressed the run on money market funds, the Fed's Commercial Paper Funding Facility (CPFF) addressed the resulting contraction of credit in the commercial paper market. The CPFF essentially created a discount window for issuers to sell three-month commercial paper to the Fed, whether or not they were banks. The CPFF was carefully designed to protect the Fed from losses and to discourage use of the facility except during a systemic liquidity event.²⁶

As to protecting the Fed from losses, the CPFF accepted only the highest-rated commercial paper. Furthermore, the interest and fees earned from the loans were substantial and were expected to

more than compensate for any defaults. As it turned out, this expectation was fulfilled *ex post*: by the time the last loan of the facility matured, the CPFF had earned approximately \$5 billion.²⁷

With respect to reserving the facility for lending of last resort, the following rules were applied. One, the maximum any issuer could borrow was the maximum amount of commercial paper it had outstanding from January 1 to August 31, 2008. This prevented the Fed from buying new commercial paper issued specifically to take opportunistic advantage of the CPFF's terms in the context of prevailing market conditions. Two, the fee of 10 basis points, the interest rate of OIS plus 200 basis points for unsecured paper, and the rate of OIS plus 300 basis points for asset-backed commercial paper,²⁸ were set at a premium relative to those that would prevail in normal market conditions. These fees and rates were to ensure that using the facility would be attractive only during liquidity events.

Like the PDCF and the TSLF in the aftermath of the bankruptcy of Lehman Brothers, the CPFF fulfilled its function as a lender of last resort in that usage skyrocketed during the worst of the crisis and gradually abated thereafter. In the first week of operation, volume rose to \$226 billion. Usage continued to rise, peaking at close to \$350 billion on January 23, 2009, before declining gradually to nearly zero by the end of 2009. The CPFF closed on February 1, 2010.

The flip-side of the success of the CPFF, of course, is the unknown extent to which its launch and operation has made issuers of commercial paper overly secure about their ability to weather the next crisis. This potential dulling of incentives to control funding risk may, in aggregate, have made the financial system more vulnerable to future liquidity events.

III. Post-Crisis Legislation and Rule-Making

The previous section related that deposit-like assets experienced runs that posed threats to systemic stability and that authorities reacted with a combination of liquidity facilities and bailouts. This section begins with the legislative and regulatory responses to this facet of the financial crisis. As will become clear, the vulnerability of the financial system to runs on deposit-like assets has not been addressed; bailouts, while outlawed in theory, are most probably not extinct; lending of last resort to nonbanks is still the fallback policy in a crisis; and, given the implicit safety nets, moral hazard remains a problem.

a. Dodd-Frank

In response to the events described in the previous section, the Dodd-Frank law takes the following, multi-pronged approach.

First, rely on improved regulatory oversight and on new resolution authorities to reduce the likelihood of catastrophic firm failures and to contain the fallout of failures that do occur. This paper, however, implicitly assumes that new oversight and resolution powers will not succeed in eliminating all future firm failures and runs on deposit-like assets. The recent collapse of MF Global certainly supports skepticism with respect to the ability of regulators to foresee, let alone prevent, all failures.

Second, outlaw bailouts of nonbanks. While Dodd-Frank does purport to do this, this subsection argues that there are several ways in which bailouts of nonbanks can still legally occur. It is also not inconceivable that authorities will bend the law should a future crisis threaten to overwhelm existing

safeguards. In any case, moral hazard problems remain to the extent that bailouts are thought to have been kept as part of the government's toolkit.

Third, make the Fed more politically accountable for any broad-based, lender-of-last-resort facilities for nonbanks. This part of Dodd-Frank enshrines the transfer of risk from nonbanks to the public in a crisis and solidifies a concomitant amount of moral hazard.

The Outlawing of Bailouts is far from Foolproof

In lending to primary dealers and to nonbank issuers of commercial paper, that is, in expanding its lending beyond banks, the Fed relied on Section 13(3) of the Federal Reserve Act, which gave it authority to extend credit to "individuals, partnerships, and corporations" in "unusual and exigent circumstances." Dodd-Frank—more in response to the Fed's bail out of Bear Stearns and AIG through the Maiden Lane facilities than in response to the liquidity programs described in the previous section—limited this authority by amending Section 13(3).²⁹ The revised law allows emergency lending by the Fed to "participants in any program or facility with broad-based eligibility," specifically requiring that such lending be designed to provide liquidity to the financial system and not to prop up a particular firm in distress. The Fed is also required to obtain prior approval for such programs or facilities from the Secretary of the Treasury; to collateralize loans in order to protect taxpayers from loss; to make various reports to members of Congress and the public about the terms of the loans extended and about the borrowers; and to terminate emergency programs or facilities in a timely and orderly fashion.

While Dodd-Frank does explicitly outlaw Fed bailouts of individual nonbanks, there remain two important loopholes. First, a program with broad-based eligibility can, in practice, be used mostly by one institution. As discussed in the previous section, the PDCF was structured with broad-based eligibility but, in March 2008, was used mostly by Bear Stearns. Second, the Fed can allow a nonbank to become a bank holding company, as in the cases of Goldman Sachs and Morgan Stanley in 2008, and then provide liquidity to that new bank. The size of this loophole, however, is limited by the quality of collateral that is required to transfer liquidity from a bank holding company to its nonbank subsidiaries.

Bailouts are also outlawed in theory, but perhaps not in practice, in the Dodd-Frank liquidation authority. In theory, the FDIC will wind down a systemically important institution in an orderly manner without cost to the taxpayer. Any required funds are to be advanced by the Treasury and then eventually recovered from creditors and, if necessary, from other large and systemically important financial institutions by means of *ex post* assessments. Controlling the costs of winding down a complex financial institution in the midst of a crisis, however, is far from easy. And levying assessments on other systemically important financial institutions in the midst of a crisis also seems problematic. Therefore, it is by no means certain that it will be feasible for the FDIC to liquidate a large financial firm in a crisis without a bailout.³⁰

The Use of Ad Hoc, Nonbank Liquidity Facilities in a Crisis is Essentially Preserved

With respect to the Fed's using facilities in the next crisis similar to those used in 2008, namely, the TSLF, the PDCF, and the CPFF, Dodd-Frank imposes only relatively minor hurdles. First, obtaining the prior approval of the Secretary of the Treasury could, at least in theory, slow down and politicize the process. On the other hand, since the Department of the Treasury and the Fed seem to have

coordinated very closely during the crisis of 2007-2009, and specifically in the creation of these facilities,³¹ the prior approval requirement Dodd-Frank may not prove much of a hurdle in practice.

A second minor hurdle to using nonbank liquidity facilities in the next crisis is the set of Dodd-Frank reporting requirements. The fear of reporting requirements in this context is that solvent financial institutions will shy away from using a facility if borrowings are made public and can be interpreted as evidence of weakness. This dynamic would thwart the policy goals of having institutions use a facility to shore up confidence in the system as a whole and of avoiding mishaps with systemic consequences. Since the specific provisions of Dodd-Frank are quite sensitive to this issue, however, it is likely that officials will ensure that reporting requirements do not impede the provision of liquidity in a crisis.

b. Emergency Economic Stabilization Act of 2008

This act explicitly prohibits the Treasury from using the exchange stabilization fund to guarantee money market funds, as was done in September 2008. With this change it is unlikely that the Treasury could forestall future runs on money market funds. As discussed in the previous subsection, however, the Fed could still act in a crisis by providing liquidity to the funds or to issuers of commercial paper.

c. SEC Money Market Fund Rule Changes

In a response to the run on money market funds in 2008, the SEC changed and added rules governing industry practices.³²

First, rule 2a-7 was changed in several ways to reduce allowable interest rate risk and credit risk, to increase the fraction of assets held in highly-liquid securities, and to improve risk and liquidity management practices.³³ These changes will most likely reduce the market risk of money market funds and increase their capacity to meet redemptions. The systemic effects of some of the changes, however, are hard to predict. Reducing weighted-average maturities of fund portfolios, for example, might force borrowers into shorter-term financing and increase their funding risk.

Second, rule 30b1-7 was added to increase the transparency of fund holdings through various reporting requirements. This rule will reduce the number and extent of surprise announcements that can trigger runs.

Third, rule 22e-3 was added to allow a fund that has irrevocably decided to liquidate assets to suspend redemptions and postpone the payment of proceeds. This rule will enable funds already in liquidation mode to dispose of their assets in a relatively orderly manner and with less market disruption. It is possible, however, that making it easier to suspend redemptions could increase the likelihood of a run as investors take preemptive action in fear or anticipation of those redemptions.³⁴ In fact, given the attraction of the deposit-like liquidity of money market funds, the fact that the Reserve Primary Fund suspended redemptions might have been a bigger factor in the subsequent run on prime funds than its having broken the buck. In the words of one analysis, “Losses, of course, are undesired—but a suspension of redemptions is intolerable.”³⁵

While this collection of SEC rule changes may succeed in reducing the likelihood of runs, it is generally accepted that the risk of runs has not been eliminated and that the fallout from runs has not been contained.³⁶ Most obviously, so long as funds are taking any risk there is always a chance of losses and of fallout that engulfs borrowers like commercial paper issuers. Less obviously, constraining the

market and liquidity risk of money market funds will reduce their returns and ultimately cause at least some of the demand for deposit-like assets to shift away from these funds toward less-regulated existing or newly-created alternatives in the United States or abroad. The next section will elaborate on this idea. In any case, despite the SEC rule changes, authorities may still need to resort to bailouts or lender-of-last-resort facilities and, consequently, moral hazard is still a problem in the money market fund and commercial paper markets.

IV. Proposals Under Consideration

This section discusses various proposals for reform of the market for deposit-like assets. One set of proposals calls for the creation of back-up facilities for money market funds and, separately, for the tri-party repo system. A second set of proposals looks to change the structure of money market funds so as to make them less vulnerable to runs. The major candidates here are switching from a fixed to a floating NAV, requiring a liquidity buffer or subordinated class of shares, or imposing bank-like regulation and deposit insurance.

The proposals with respect to restructuring money market funds will be addressed individually below, but the general approach is somewhat myopic. One, a widespread and sudden refusal to roll over commercial paper, even in the absence of a run on money market funds, can cause significant systemic stress. Two, if existing forms of deposit-like assets are made less attractive, investors will migrate to alternative deposit-like assets, whether existing or newly created and whether in the United States or abroad. Consequently, the instabilities of today's money market funds could simply migrate to other financial vehicles. Since the contention that regulation cannot dramatically change the structure of money market funds without spawning new products and new systemic risks is important for the arguments of this paper, the next several paragraphs elaborate on this point.

The Strong Demand for Deposit-Like Assets Limits the Effectiveness of Regulating their Form

Pozsar (2011) describes institutional cash pools (i.e., large, centrally managed, short-term cash balances of nonfinancial corporations, asset managers, securities lenders, insurance companies, pension funds, and others) and then makes the case that their global demand for U.S.-dollar denominated, safe, and liquid assets very much exceeds the direct supply of such assets. First, survey data supports this characterization of demand, with stated investment objectives, in order of importance, being safety of principal, liquidity, and yield. Second, a conservative estimate of the total size of these cash pools in 2010 is \$3.4 trillion, with the size of individual pools varying from \$1 billion to over \$100 billion. Third, the direct supply of suitable assets is significantly smaller than this demand. To clarify this conclusion, begin with the banking system. Each cash pool has access to, at the very most, \$1.625 billion of insured deposits—\$250,000 per bank at the approximately 6,500 banks in the United States—which calculation neglects the impracticalities of spreading cash across a very large number of banks. At the same time, holding large, uninsured deposits at the relatively small number of existing large banks is not considered prudent with respect to the objective of safety of principal.³⁷ Hence, cash pools might consider short-term, government-guaranteed securities. However, while there were \$3.1 trillion of short-term Treasuries and Agencies outstanding in 2010, these assets are also in substantial demand by foreign official entities, state and local government investment pools in the United States, and others.

The critical role of money market funds in the financial system emerges clearly from the analysis of Pozsar (2011). By creating deposit-like assets from diversified portfolios of short-term assets—including more than just deposits and short-term Treasuries and Agencies—money market funds have become an indispensable supply of suitable indirect or intermediated assets for institutional cash pools.³⁸ Furthermore, money market funds are widely perceived by these pools as superior to uninsured deposits: i) the security of uninsured deposits is highly opaque, while money market fund shares are secured by a portfolio of assets in a very transparent way; ii) the credit risk in money market fund portfolios is diversified and professionally managed; and iii) despite being outside the banking system, some holdings of money market funds are guaranteed by banks through commercial paper credit lines and letters of credit. In any case, reducing the attractiveness of money market funds to institutional cash pools will almost certainly result in a rush to satisfy this demand in other ways, including “less regulated or unregulated cash management vehicles, such as offshore money market funds, enhanced cash funds, and other stable value vehicles...”³⁹

a. Proposals to Create Backstops for Repo and Money Market Funds

There have been calls for backstops in both the repo⁴⁰ and money market fund⁴¹ markets. Some of the calls are for industry-funded entities—without or with access to the discount window—and some are for government-backed entities, although it is widely believed that any private backstop of either of these markets would, almost by definition, be too big to fail and implicitly backed by the government. These proposals have not gained traction for fear of exposing the taxpayer to the costs of future bailouts and of creating moral hazard.⁴²

b. Proposals to Change the Structure and Regulation of Money Market Funds

There have been two broad categories of proposals to reform money market funds. First, move money market funds from fixed to floating NAV accounting.⁴³ Second, make the regulation of money market funds more closely resemble the regulation of banks.⁴⁴

Fixed to Floating NAV

Proposals that money market funds convert from fixed to floating NAV rely on the observation that, as discussed in Section II, the fixed NAV structure of money market funds contributes to runs. It does not follow logically, however, that moving to a floating NAV will eliminate runs nor does empirical observation support that contention. First, over the course of the crisis, floating NAV funds in both the United States⁴⁵ and in Europe⁴⁶ experienced runs. Second, repo experienced runs, as described in Section II, even though collateral is marked-to-market.

Supporters of a floating NAV would defend the policy change as reducing the frequency and severity of runs even if it does not eliminate such runs. The problem here is that managers and investors in money market funds—as represented by comment letters to the SEC on the topic and an industry working group report⁴⁷—are apoplectic at the prospect. Their consensus is that the fixed NAV feature, which makes money market accounts so much like deposits, is the *raison d'être* of the industry.

According to this view, investors demand these nonbank accounts, both to earn a higher rate of return at an acceptable increment of risk and to diversify away from individual and collective bank credits.

The proponents of a floating NAV might persist, even if investors and managers are correct that the product and industry would no longer be viable. The argument here would be that the systemic dangers of runs outweigh the intermediation benefits of the industry, that is, the transformation of short-term funding to borrowers into deposit-like assets for investors. As discussed at the start of the section, however, given the enormous demand for deposit-like assets, rule changes that make money market funds less attractive will only succeed in transferring their systemic risks to alternative products.

Regulate Money Market Funds More Like Banks

The second group of proposals in response to runs on money market funds starts from the premise that these funds really offer deposits and, therefore, should be incorporated into the current banking system. At the very least, this line of thought implies that money market funds should be required to establish liquidity buffers, subordinated shares, or reserve requirements so as to safeguard their deposit-like liabilities. At the other extreme, this line of thought implies that money market funds as entities should be reconstituted as banks, enjoying deposit insurance but subject to the full panoply of banking regulation.

One problem with imposing reserve or capital requirements against money market funds is that the determination of such requirements would be extremely difficult: money market fund portfolios suffer losses in value only in hard-to-quantify, extreme tail events. But even if sufficiently accurate reserve or capital requirements could be determined, the cost of funding such reserves or attracting such capital would be extremely high: providing such capital essentially writes a very out-of-the-money option on an economically disastrous scenario, which is known to require a high risk premium. In the context of a business that currently earns very narrow spreads, particularly in the current low-rate environment, this cost of capital could easily be crippling.⁴⁸ And, of course, even if money market funds remained viable after incurring capital costs, there is still some chance of a loss and some chance of a run. Therefore, a policy response to the resulting systemic risk, even if diminished, still has to be devised.

The more extreme proposal that money market fund accounts should be treated in law exactly as deposits, so that money market funds have to become banks, is not necessarily a step in the right direction. Satisfaction with current systems of insured deposits and bank regulation is not so overwhelming as to call for its expansion to all deposit-like assets. More specifically, reluctance to expand deposit insurance dramatically stems from concerns over several matters: the difficulties of charging appropriately for deposit insurance; the resulting risks to the taxpayer; moral hazard;⁴⁹ the growing size and concentration of the banking industry at least in part due to the ability of large banks to continue attracting deposits; and the extent to which banks have failed despite the regulatory system in place. According to one commentator, “holding out the banking system as the model for regulation... is a little perverse... [T]he number of failures and the amount that’s been lost in banks just in the last few years vastly outpaces [the experience over the last 40 years in money market mutual funds].”⁵⁰

Returning once again to the discussion at the start of this section, the broader problem with making money market funds more like banks is that alternative, more attractive forms of deposit-like

assets will emerge outside of bank-like regulation. As a result, these proposals will ultimately succeed only in shuffling systemic risk from money market funds to these alternative financial vehicles.

V. Federal Liquidity Options (FLOs)

Sections II and III showed that deposit-like assets are still subject to runs and that the fallback policy for containing the resulting fallout is still lending of last resort and possibly bailouts. This state of affairs is unsatisfactory for two reasons. First, the standing policy in a crisis should not be the rescue of nonbanks at the risk or expense of the public. Second, general awareness of this broad safety net creates moral hazard that increases the likelihood and severity of future crises.

As an alternative to the *status quo*, this paper proposes that the Fed auction Federal Liquidity Options (FLOs) as the exclusive means of providing liquidity to nonbanks in a crisis. The advantages of the proposal, as described in this section, are the following. One, the FLO program will be a pre-crisis sale of liquidity options at auction-determined prices, not an *ex post* rescue of nonbanks. Two, the FLO program will, by construction, be widely accepted as an appropriate and sufficient response to the illiquidity of nonbanks in a financial crisis, thus relieving the pressure for extraordinary and *ad hoc* rescues and bailouts. Third, since the pledge of FLO exclusivity will be credible, moral hazard will be minimized. Fourth, the ability of relatively small institutions to buy FLOs counters the too-big-to-fail advantage of the largest market participants in the current policy regime.

Section 13(3) of the Federal Reserve Act, as amended by Dodd-Frank, allows the Fed to provide liquidity to any participant in a broad-based facility in “unusual and exigent” circumstances. Since the proposal here calls for the Fed to sell liquidity options on a regular basis and to honor their exercise at the discretion of the buyer, the FLO program probably requires an act of Congress, although it is certainly not the purpose of this paper to make that determination. Given the objectives of the program, however, Congressional approval should be sought. Building credibility around the pledge of FLO exclusivity is best achieved through a broad and public debate about that pledge and its consequences.

Subsection a. describes the terms of a FLO and how they achieve the program’s policy objectives without exposing the Fed to unnecessary risk or spawning unintended consequences. Subsection b. describes the appeal of FLOs and their likely use by financial institutions to manage liquidity risk. Subsection c. discusses the issuance of FLOs in the context of the program’s policy objectives. Subsection d. presents a supplementary program through which the Fed can sell some of its risk from FLOs to private investors.

a. Terms of a FLO

Purchasing a FLO gives the holder the right to borrow money from the Fed on a secured basis at a predetermined rate and under prearranged collateral terms. Table 1 presents a sample FLO term sheet.

The FLO in Table 1 would be auctioned by the Fed on January 1, 2012. It gives the holder the right for one year, starting on April 1, 2012, to borrow up to \$100 million from the Fed for 90 days on collateral eligible for tri-party repo, with some diversification requirements. The precise definition of a diversified portfolio would be part of the contract.⁵¹ Note that the one-year exercise period and the 90-day loan term makes this a “1y90d” FLO.⁵²

Table 1: Sample Term Sheet for a 1y90d Federal Liquidity Option

Trade Date	1/1/12
First Exercise Date	4/1/12
Last Exercise Date	3/30/13
Notional Amount	\$100mm
Loan Term	90 days, which may be spread over the exercise period
Option Premium	.05% or \$50,000 annually; payable monthly from 4/1/12 to 3/1/13
Eligible Collateral	Tri-party repo eligible collateral, divided into four categories, with unlimited rights of substitution. Collateral other than Treasury and Agency securities have to be bundled into diversified portfolios. I: Treasuries and Agency MBS II: Agency Debentures & Strips, Agency CMOs, unsecured CP III: Investment Grade Corporates IV: ABCP, ABS, private-label CMOs, non-investment grade corporates, equities
Loan Rate	90-day OIS + 150, 200, 250, and 300 bps for categories I through IV, respectively.
Haircuts	2%, 5%, 10%, and 15% for categories I through IV, respectively.
Variation Margin	After exercise, daily margin calls will be used to maintain the required haircut.
Secondary Sale	Buyers in the secondary market begin paying premiums and may first exercise the option three months after the trade date. Sellers stop owing premiums and lose the right to exercise as of the trade date.

The Lag between the Purchase and First Exercise Dates Controls Adverse Selection

Although the FLO is sold on January 1, 2012, the option to borrow is first exercisable on April 1, 2012. The purpose of this lag is to prevent a firm that is already distressed from buying and immediately exercising a FLO. This is important for three reasons. First, the FLO program is not intended to provide liquidity to firms that are in trouble under normal market conditions. Second, allowing firms to purchase liquidity options in a crisis and exercise them immediately has moral hazard implications similar to lending of last resort. (As explained below, however, firms that neglected to purchase FLOs will have access to intermediated FLO liquidity.) Third, with the appropriate amount of FLOs outstanding, the Fed can achieve its objective of providing liquidity without exposing itself to the particularly significant risk of lending to firms that are already in distress. Note that secondary sales also have a three-month lag for exactly the same reason.

Secondary Sales Increase the Attractiveness of FLOs but Introduce Some Complications

The existence of secondary markets always increases the attractiveness of an asset. There are some important complications, however, in the secondary trading of FLOs. The fact that there is a three-month lag between the trade date and the date at which a buyer starts to pay premiums and may first exercise the option raises the question of whether the seller can exercise the option during these three months. If yes, there would have to be some adjustment to the trade price because the buyer would be

getting an option with fewer days of exercise than expected as of the date of sale. If not, then the seller should not have to pay premiums over the three-month lag. For simplicity, Table 1 assumes that the seller cannot exercise and does not have to pay premiums as of the trade date.

The fact that the seller loses the right to exercise before the buyer gains the right to exercise creates some complications for the Fed. The program calls for a certain notional amount of FLOs to be outstanding at any time. If a significant secondary market does develop, however, the effective notional amount outstanding, i.e., the amount that can be exercised, can fall below the actual amount outstanding. In that case the Fed would have to adjust the amount outstanding, perhaps by its own secondary trading.

The Exercise Period is Longer than the Loan Term so that FLOs Do Not Replace Term Lending

The exercise period of one year is set to be longer than the 90-day term of the loan so that FLOs do not replace term funding as a means of eliminating funding risk. Consider an asset manager that plans to buy a long-term asset on April 1, 2012, and hold it for one year. If the manager arranges term financing for a year, the portfolio has no funding risk: regardless of market conditions, the asset would not have to be sold before the end of the planned holding period.⁵³ If, instead, the manager finances the asset overnight and buys a 1y90d FLO, funding risk remains: in a liquidity event that makes it impossible to fund the asset overnight, the manager will exercise the FLO and have 90 days to arrange alternate financing or sell the asset. In this sense, FLOs are a tool for liquidity management and protect the system from fire-sales in the wake of a liquidity event, but, do not, on their own, constitute a long-term, viable financing strategy for an asset management business. To complete this discussion of the relative lengths of the exercise period and the loan term, note that a 1y1y FLO (which would give the right, exercisable over a year, to borrow for a term of one year) would eliminate funding risk over a year. The asset manager introduced in this paragraph could buy a 1y1y FLO first exercisable on April 1, 2012, and fund the asset overnight. If there were a liquidity event at any time over the following year, the manager could exercise the FLO and fund the asset to the end of the holding period at the Fed.

The Fed Should Offer Several Exercise Period-Loan Term Combinations

While, for the reasons just given, the exercise period of a FLO should be substantially longer than the loan term, there are many possible choices for the exact lengths of the exercise period and the loan term. Aside from the 1y90d FLO presented in Table 1, for example, there might be a 3m30d FLO, which would give the right to a 30-day loan exercisable over three months. In practice, it would most likely be best for the Fed to offer a few exercise period-loan term combinations so as to satisfy different potential users of the options.

An asset manager holding relatively long-term securities would favor something like the 1y90d FLO. The 90-day loan term accords with assumptions typically made in liquidity management as to the typical length of a funding crisis and as to a prudent amount of time to allow for finding buyers or alternate funders of securities in a crisis. The one-year exercise is a compromise of competing objectives. Too short an exercise period would require that options be rolled too often, which would incur relatively large operational and transaction costs. Too long an exercise period, however, would

make it relatively costly to manage the liquidity risk of portfolios that fluctuate in size and composition as FLOs would have to be traded in secondary markets.

While the asset manager described in the previous paragraph favors the 1y90d FLO, a money market fund manager might prefer the 3m30d FLO. The 30-day loan suits this manager, who buys very short-term assets and, consequently, needs relatively short-term contingent liquidity with which to fund unexpectedly large redemptions until assets mature.

Option Premium and Moral Hazard

The specific value of the option premium in Table 1 is just an example; the actual premium will be determined by an auction of a specific quantity of options, as described in subsection c. The important point is that market participants will have to pay for access to lending of last resort at a market-determined price. This has the great advantage of forcing market participants to internalize the cost of lending of last resort and, therefore, of limiting moral hazard.

Notwithstanding the benefits of the proposal with respect to controlling moral hazard, it should be pointed out that moral hazard will not be eliminated completely. A crucial part of the proposal is for the government to calibrate the quantity of FLOs outstanding to achieve its lending of last resort objectives. But since the social costs of a financial meltdown almost certainly exceed the sum of the private costs of potential purchasers of FLOs, the market-determined option premium at the quantity set by the government will probably be less than the theoretically true cost of providing that amount of liquidity. This implies that market participants will internalize too small a cost of liquidity in a crisis and take on more liquidity risk than socially optimal. Relative to *ex post* lending of last resort, however, internalizing the cost of liquidity to the extent of the FLO premium dramatically reduces moral hazard.

Collateral Eligibility Rules Reinforce the Credibility of FLO Exclusivity

There are two important considerations in setting collateral eligibility rules. One, avoid assets with prices so volatile or liquidity so unreliable that appropriate haircuts are difficult to determine. If haircuts for these assets prove to have been set too low, the Fed bears more risk than intended. On the other hand, if these haircuts are set too high, the facility will not have provided as much liquidity as intended. Second, include assets that are commonly used for short-term financing. If a significant portion of such assets are not eligible as collateral, then the pledge of FLO exclusivity will not be credible: in a crisis, authorities will not be able to refrain from extending liquidity to the assets that borrowers had actually been pledging. In September 2008, for example, the Fed broadened collateral eligible for the PDCF to include all collateral eligible for tri-party repo.

Unfortunately, under current law and market practice, the two conditions of the previous paragraph are often in conflict. For example, many would argue that private-label, non-investment grade CMOs are inappropriate collateral for short-term financing, but they are currently eligible for tri-party repo (although they constitute a very small share of that market). As it turns out, a proposed solution to another problem in financial markets would discourage the short-term financing of hard-to-price and illiquid assets by narrowing the assets eligible for tri-party repo to those whose haircuts can be determined with reasonable certainty. This would, of course, make the two conditions perfectly compatible.

The proposal mentioned in the previous paragraph is to narrow the “safe harbor” for derivatives and repo contracts to liquid assets.⁵⁴ This safe harbor allows a counterparty of a derivatives or repo agreement, upon the default of another, to terminate these agreements, to liquidate collateral, and to net obligations without having to wait for the determination of a bankruptcy court. For the purposes of this paper, the arguments for narrowing the safe harbor to liquid assets are not important. If the safe harbor were narrowed in this manner, however, the short-term financing of illiquid assets would fall dramatically as short-term lenders—who have strong preferences for liquidity—would, upon a borrower default, have to deal with a bankruptcy court and line up with other creditors. As a result, tri-party eligible assets would naturally narrow to liquid assets. Furthermore, allowing these same assets to be eligible against FLO borrowing would satisfy both the condition that haircuts be determined with reasonable certainty and the condition that eligible collateral include all asset classes commonly pledged against short-term borrowing.

In markets as they are today, with the safe harbor too broad and with overly difficult-to-price and illiquid assets routinely funded short term, the two conditions for eligibility of assets against FLO borrowing are in conflict. The recommendation of this paper is to include all assets eligible for tri-party repo. The credibility of FLO exclusivity, which depends on broad eligibility of collateral, is absolutely critical. Also, appropriate haircuts can be approximated for all assets, even if they cannot be determined with great reliability for illiquid assets. Of course, should the safe harbor be narrowed eventually and tri-party eligible assets narrow as a result, FLO-eligible assets should narrow in exactly the same way.

The diversification requirement on collateral other than Treasuries and Agencies is meant to protect the Fed from unnecessary risk and to prevent entities who are not regular borrowers in financial markets from using FLOs opportunistically to issue paper. Put more dramatically, lending against the paper of a single issuer has a lot of credit risk and is subject to abuse by that borrower. As described in Section II, the CFFF controlled opportunistic issuance by requiring borrowers to have recently issued a similar amount of paper. The FLO program, which is designed for a more expansive set of borrowers, could not sensibly impose a similar restriction. Instead, the diversification requirement prevents individual issuers from exercising FLOs directly. Commercial paper issuers requiring contingent financing could make arrangements with each other or with financial institutions to pool paper when exercising FLOs, thus enabling them collectively to post diversified portfolios of collateral to the Fed.

There seems to be a consensus that it is undesirable for laws and regulations to depend on ratings. Dodd-Frank, in fact, requires that references to ratings be eliminated from laws and regulations. Unfortunately, however, an adequate substitute for ratings has not yet been found. For present purposes, therefore, Table 1 makes no attempt to remove reference to ratings from the current tri-party repo asset groupings.

Finally, Table 1 gives the borrower “unlimited rights of substitution.” This means that, after posting an initial portfolio of collateral, a borrower can freely substitute new collateral for collateral already posted. Of course, loan rates and required haircuts at any time are determined by the portfolio of collateral posted at that time. Rights of substitution are valuable to borrowers trying to manage their funding, particularly in a crisis, and the costs and risks to the Fed of granting these rights are essentially limited to transaction costs.

Penalty Rates and Haircuts Preserve the Use of FLOs for Liquidity Events

The loan rates and haircuts are designed so that market participants will exercise their options in a systemic liquidity event—that is the point of the program—but will not exercise their options and tap the Fed under normal market conditions. This is achieved by setting the loan rate above the rate that would prevail in normal market conditions but below the rate that would prevail in the midst of a crisis. Similarly, the haircuts are designed to be conservative by the standards of normally functioning markets, so as to protect the Fed from loss, but low relative to what would prevail in a crisis.

Given the structure of FLOs, it is certainly possible that they would be exercised for a firm-specific liquidity event so long as that firm had bought FLOs at least three months before exercise. While an unavoidable side effect of the program, these isolated events should not put the Fed at a significant risk of loss given the various protections built into the terms of a FLO.

The specific loan rates and haircuts chosen for Table 1 are roughly based on rates used in past and existing liquidity programs and on currently prevailing haircuts in tri-party repo. In particular, the discount rate at the secondary credit discount window, which is not for the strongest banks, is currently 1.25%, i.e., 100 to 125 basis points above fed funds,⁵⁵ while, as mentioned earlier, rates of the CPFF were OIS + 200 basis points for unsecured commercial paper and OIS + 300 for asset-backed commercial paper. Consequently, the rates in Table 1 are above those of the PDCF, which, designed for primary dealers only, were set at primary credit discount window rates.⁵⁶ As for haircuts, the levels of Table 1 closely correspond to the 90th percentile levels, i.e., the relatively conservative levels, prevailing in the tri-party repo system.⁵⁷ Levels were adjusted, however, to fit the data from 11 collateral buckets into the four collateral buckets of Table 1. As a final note on FLO haircuts, higher levels than those in Table 1 would most probably be applied to borrowers who are subject to Reg T.

b. The Use of FLOs by Financial Institutions

The policy goals of the FLO program are discussed throughout this paper. This section discusses why financial entities will choose to purchase FLOs, how they will use FLOs, and how the resulting dynamics are expected to be consistent with the program's intended policy goals.

FLOs and their Market-Determined Premiums Will be Useful for Liquidity Management

Liquidity management, which balances the need to maintain funding through stressful times against the cost of doing so, has always been important, but has received much more attention since the events of 2007-2009. Investment banks need to convince regulators, creditors, and equity holders that they are not overly dependent on short-term funding while, at the same time, cannot pay too much for the security of longer-term funding. Hedge funds and money market funds must have the same conversations with their investors.

Two particular difficulties that arise in the practice of liquidity management are the following. First, very few sources of funding are completely dependable. As mentioned earlier, during the recent crisis it proved difficult to raise money even on the safest collateral. Second, funding liquidity is very difficult to price. For example, how much extra should one pay to finance an asset for six months rather than roll over financing weekly?

Financial institutions will find FLOs attractive for liquidity management purposes because they address these two difficulties. First, by virtue of its power to create money, the Fed—and by extension FLOs—are completely reliable sources of funding in a crisis. Second, the price of FLOs can play an important role in liquidity management. Most directly, a broker-dealer can weigh the liquidity assurances of FLOs against their cost. Less directly, prime brokers and money market funds, which provide liquidity to their customers, can pass the cost of the requisite FLOs through to those customers. From a policy perspective, both direct and indirect uses of FLOs cause market participants to internalize the cost of contingent liquidity and, consequently, to make appropriate choices with respect to liquidity management.

FLOs can play a particularly important role in the liquidity management of industry utilities, like clearinghouses and the tri-party repo system.⁵⁸ It is widely recognized that utilities are usually too-big-to-fail, but, as discussed earlier, there is a reluctance to have these utilities dependent on the general public through the Fed and an aversion to perpetuate yet another source of moral hazard. The FLO program would resolve this conundrum. Utilities can buy FLOs to safeguard their liquidity and then pass the costs on to their members and users. Note furthermore, that FLOs easily resolve the currently contentious issue as to what collateral may be posted against clearinghouse positions: any collateral eligible for FLOs can be posted, but the party posting collateral has to bear the cost to the clearinghouse of ensuring the liquidity of that collateral through the purchase of FLOs.

In discussing the usefulness of FLOs to nonbanks, the following comment is in order. During the crisis, several investment banks became part of a bank holding company with access to the discount window. The rules concerning the transfer of cash and collateral between an investment banking entity and its bank holding company, however, as mentioned earlier, are quite strict. Therefore, it is incorrect to conclude that these investment banks have solved their liquidity problems through access to the discount window. Put another way, these investment banks still face significant liquidity challenges that can be managed more effectively with FLOs.

As a final comment on how FLOs might transform liquidity management, recall that most commercial paper issues cannot sell paper without paying a bank for a credit line, which provides that the bank will lend money to an issuer to pay off maturing paper should that issuer not be able to sell new paper. FLOs would compete for that business: an issuer could arrange to pay a financial intermediary for FLOs. Then, should the need arise, the intermediary would exercise the FLOs, pool that issuer's commercial paper with other assets, and post the portfolio to the Fed in exchange for cash. This potential competition would be an improvement on the current state of affairs. First, when commercial paper issuers are having trouble raising funds, banks are also likely to be experiencing stresses that would only be exacerbated by having to honor credit lines. Second, it is quite difficult for regulators to account properly for the contingent liquidity risk of banks incurred by selling credit lines. Third, in the complex environment of deposit insurance and too-big-to-fail status, the implicit cost of a bank selling liquidity protection is quite opaque, while the cost of FLOs is quite transparent.

Example: A Money Market Fund Uses FLOs to Manage its Liquidity Profile

Consider a money market fund that invests 10% of its assets in overnight securities, 30% in five-day securities, and 60% in 90-day securities. This portfolio just satisfies the new 2a-7 liquidity

requirements. Also, the weighted-average maturity of the portfolio, at about 56 days, falls below the new 2a-7 limit of 60 days.

Say that the manager of the fund has determined that their predominantly institutional base of investors is likely to redeem very quickly in a crisis. In particular, the manager wants to be able to meet stress levels of 25% redemptions over five days and a total of 50% redemptions over two weeks. Based on the maturities of the portfolio, 25% redemptions over five days are easily met by the 40% of assets that mature in five days or less. Given that the remaining securities mature in 90 days, however, the fund would not be able to meet the stress level of 50% redemptions over two weeks. To address this gap, the fund could buy 1y90d FLOs at a quantity corresponding to 10% of its assets. In a liquidity event, the fund would borrow 10% of the original portfolio from the Fed, meet redemptions, and then pay the Fed at the end of the 90 days as assets matured.

FLOs Can Provide Liquidity in a Crisis to Those Who Had Not Bought Them

As described earlier, FLOs avoid adverse selection by preventing an entity from buying a FLO and exercising it immediately. This does not imply, however, that entities who have not bought FLOs have no access to emergency liquidity. If that were the case, it would seriously undercut the credibility of the pledge of FLO exclusivity.

Say that a hedge fund needs to fund an eligible portfolio of assets but has not bought FLOs. It can ask a broker-dealer that has FLOs to intermediate the financing. More specifically, the hedge fund would borrow money from the broker-dealer, posting its portfolio as collateral. The broker-dealer, in turn, would borrow money from the Fed, posting the hedge fund's portfolio. Importantly, the Fed is providing the liquidity in this transaction, but the broker-dealer—who most probably has a relationship with the hedge fund—keeps the counterparty risk of transacting with the hedge fund. Of course, in intermediating for the hedge fund, the broker-dealer could demand a fee and could request collateral in excess of that demanded through the FLO.

It may happen that the hedge fund cannot convince anyone to intermediate its financing. If this is so because the hedge fund is not really solvent, then the outcome is fine from a policy perspective. If intermediation is unavailable because everyone who has a FLO is exercising, then the outcome is again fine from a policy perspective: by construction, there are enough FLOs outstanding to prevent a systemic collapse. If, however, intermediation is unavailable because the hedge fund cannot find or does not have a relationship with an appropriate counterparty, then the outcome is not ideal. This, unfortunately, is the flip-side of limiting moral hazard.

The fact that liquidity provision through intermediation of FLO financing is not as reliable as the direct provision of such liquidity suggests two rules for program design. One, the notional amount of FLOs outstanding should err on the side of plenty. Two, a limit should be imposed on the holding of FLOs by any single entity so as to facilitate the broad distribution of the chosen notional amount. This limit would most sensibly be some relatively generous fraction of the entity's assets, e.g., 50%: it is highly unlikely that a prudent amount of short-term funding for an entity exceeds 50% of its assets.

Participation in the FLO Program Should be Relatively Free of Stigma

The Fed creates liquidity programs when it decides that the injection of liquidity would be good for the system. It is a problem, therefore, when financial institutions decline to participate in such programs because they do not want to be perceived by the Fed, their competitors, or their customers as financially weak. As a result, the Fed attempts to design programs that are free of stigma. This consideration was significant, for example, in the Fed's revamping of discount window borrowing for stronger banks in 2003. In particular, before the changes, loans were made at a rate below fed funds and with borrowers' having to explain fully why they needed to visit the window. Currently, by contrast, loans are made at a rate above fed funds and entail minimal administrative and explanatory burdens.⁵⁹

The FLO program should be relatively free of stigma. First, auctioned products tend to be viewed as market transactions at fair market prices rather than as handouts by the Fed. It has been remarked, for example, that the TSLF did not suffer from stigma because of its auction mechanism.⁶⁰ Second, as discussed earlier in this section, the purchase of FLOs can be credibly presented as part of a prudent liquidity management strategy. Third, since the exercise of FLOs—as opposed to their purchase—might very well be viewed as a sign of weakness, there should be a two-year lag between exercise and the publication of data on the exercise of FLOs. This two-year lag is consistent with the publication lag provided for by Dodd-Frank with respect to the Fed's standing lending facilities.

c. Issuance of FLOs

The Fed will auction FLOs according to a preannounced and regular calendar. Issuance should be scheduled so that the exercise periods of the FLOs overlap somewhat, to avoid a situation in which all FLOs mature at the same time. Continuing with the example of the 1y90d FLOs, a semiannual auction schedule might look something like this: an auction on January 1, 2012, for FLOs that can be exercised from April 1, 2012, to March 31, 2013; an auction on July 1, 2012, for FLOs that can be exercised from October 1, 2012, to September 30, 2013; an auction on January 1, 2013, for FLOs that can be exercised from April 1, 2013, to March 31, 2014; etc.

Setting the Notional Amount of FLOs Outstanding

As mentioned several times in this paper, the total notional amount of FLOs outstanding has to be set so that officials, in the midst of a crisis, can confidently claim that enough liquidity is being added to safeguard the viability of solvent nonbanks. This is one of the more challenging calibrations of the proposal. A starting point is the liquidity provision of the Fed to nonbanks during the crisis of 2007-2009.

Lending to nonbanks through the PDCF, AMLF, TALF, and CPFF peaked in the fourth quarter of 2008 at a bit under \$380 billion. The TSLF in that quarter reached a peak of about \$220 billion. Finally, the Treasury's \$50 billion guarantee of money market funds was in place at that time as well. Since the grand total of these amounts is \$650 billion, this paper proposes a conservative \$750 billion for the notional outstanding of FLOs.

The appropriateness of this order of magnitude for the current environment can be assessed relative to the size of the relevant markets. From this perspective, the \$750 billion covers 29% of the \$2.6 trillion of prime money market fund balances as of September 2011; 75% of the \$1.0 trillion of

commercial paper outstanding as of the same date;⁶¹ and 44% of the \$1.7 trillion of tri-party repo outstanding as of early December 2011.⁶²

A process for setting the notional amount of FLOs outstanding could be that every year, or at the special request of the Fed, the Fed proposes a range of notional amounts to Congress and then Congress enacts a final range. This process furthers the objectives of the program for the following reasons. First, a periodic assessment of the appropriate size of the FLO program is necessary for the ongoing pledge of FLO exclusivity. Second, a range of notional amounts, along with the ability to request a change to the existing range at any time, grants the Fed needed discretion to respond to auction results and to changes in market sizes and conditions. Third, along the lines of the argument with respect to the initial legislation of the FLO program, an open and public debate concerning the amount of FLOs outstanding can be used to trumpet the commitment to refrain from rescues and bailouts. Put another way, the political process proposed here will make it more difficult for authorities to deviate from their commitments in a crisis and, consequently, will increase the *ex-ante* credibility of the FLO program.

Broad Participation in the Program is Desirable

Counterparties will have to register with the Fed before buying FLOs. This will clearly be necessary for operational reasons, but might also be used by the Fed to screen out unsuitable counterparties. For example, individuals or very small hedge funds might be judged too small or too much of a credit risk, even when lending on collateral, to participate. This discretion should not be used to rule out too many counterparties, however. First, the collateral and haircuts of the program are structured to protect the Fed. Second, since the epicenter of the next crisis is unknown, it would be unwise to limit FLO protection to particular segments and channels of the financial system. While it is true that FLO owners can intermediate liquidity to others without any prior arrangements, more direct and prearranged transmissions of liquidity are more certain. Third, widespread participation in the program will help achieve an auction price as close as possible to some theoretically fair price of crisis liquidity. Fourth, broad participation in the FLO program, by enabling relatively small players to demonstrate viability in a crisis, counters the too-big-to-fail advantage of the largest market participants in the current policy regime.

d. Private Sector Participation in Last-Resort Lending through FLOs⁶³

To reduce the risk to the Fed of its lending through the exercise of FLOs, the private sector might be invited to share in the premiums collected by the Fed in exchange for participating in any losses it ultimately incurs. The basic structure of such participation can be illustrated with the following example. Say that a private party underwrites the risk of one FLO with a notional amount of \$100mm and a premium of 5 basis points. That party would then post a *participation haircut*, i.e., some fraction of the \$100mm, say 5% or \$5mm, to the Fed in Treasury securities and, in exchange, receive the entire premium of 5 basis points annually on \$100mm or \$50,000. If the FLO is never exercised, or if the FLO is exercised and the borrower repays the loan, the private option writer earns an extra 1% annually on the posted collateral (\$50,000 on \$5mm). If, on the other hand, the FLO is exercised and the borrower defaults, the option writer might lose money. Say that, through the exercise of the FLO, the Fed has a

loan of \$100mm outstanding against \$105mm of Agency debentures and that the borrower defaults. (Table 1 gives 5% as the haircut for Agency debentures.) If the Fed can sell the Agencies—which have been subject to daily variation margin calls—for more than \$100mm, the Fed suffers no loss on its loan and returns the \$5mm of collateral to the private option writer. If, however, the Fed sells the Agencies and receives only \$97 million, then the Fed, to make itself whole, will keep \$3mm of the option writer’s collateral and return only \$2mm. Of course, if the proceeds from selling the Agencies are less than \$95 million, the Fed suffers a loss even after keeping all \$5mm of the option writer’s collateral.

The participation haircut is obviously an important parameter of the program. If the entire premium is to be given to the private option writer, as in the example, then the participation haircut should be set so that the residual risk to the Fed is essentially zero. A relatively conservative approach would be to set this haircut equal to the collateral posted by FLO borrowers, thus doubling the buffer protecting the Fed’s loan. Unfortunately, however, the exact composition of the collateral to be posted by FLO borrowers is not known in advance and it is impractical to have the participation haircut jump as the FLO is exercised and as collateral composition changes. Hence, a single and reasonable participation haircut has to be determined.

As it turns out, a 5% participation haircut, as in the example, is a reasonable order of magnitude. First, the weighted-average haircut computed from the haircuts in Table 1 and from the composition of collateral currently being posted in tri-party repo is just over 4% and, excluding Treasuries, just over 5%.⁶⁴ Second, the haircut for commercial paper in Table 1 is 5%. Therefore, under the rough assumption that borrowers exercising FLOs will, in aggregate, post some slice of the collateral currently being posted in tri-party plus some amount of commercial paper, a haircut of 5% would essentially double the buffer protecting the Fed’s loans.

To summarize the basic idea of the private participation program, private parties post collateral to the Fed in exchange for the FLO premium. Given the way FLO haircuts are set, the likelihood that the private option writer loses money is small. Furthermore, given the setting of the participation haircut so as to essentially double the buffer protecting the loan, the likelihood that the Fed loses money is extremely small.

With the high-level explanation of the participation program complete, a more specific set of terms can be outlined:

- When a FLO is issued, the private option writer posts Treasuries with value equal to the notional amount of the FLO multiplied by the participation haircut. A possible extension is to allow other collateral at some set of haircuts.
- The private option writer is subject to variation margin calls to ensure that posted collateral remains equal to the notional amount multiplied by the participation haircut. Any shortfalls have to be topped up and any surpluses may be withdrawn. Failure to meet a variation margin calls results in forfeiture of future option premiums.
- Any coupon interest on the collateral is passed back to the option writer, subject to the minimum collateral requirements.
- Any losses from the FLO program each month are apportioned *pro rata* across the option writers of a particular FLO issue from their posted collateral. Once this collateral has been depleted, any remaining losses are borne by the Fed.
- The premiums paid on a FLO issue are passed *pro rata* to the option writers.

VI. Conclusion

Since 2008 it has been widely recognized that deposit-like assets are vulnerable to runs and that these runs are a source of systemic risk. Nevertheless, the *de facto* policy fallback is *ad hoc* lending in the midst of a crisis, which is highly unsatisfactory because it essentially rescues financial institutions at the risk or expense of the public and because it creates significant moral hazard.

Recent legislation, regulation, and policy proposals have not been particularly successful at addressing the fault lines of deposit-like assets. First, regulators cannot possibly be expected to detect and prevent all future financial crises. Second, given the phenomenal demand for nonbank, deposit-like assets, this product class cannot be outlawed or forced into the banking system.

This paper attempts to direct policy toward formulating a credible, *ex ante* plan for responding to a crisis so as to i) break the connection between lending of last resort and rescues or bailouts of nonbanks; and ii) minimize the moral hazard of expected government interventions during a crisis. In particular, the paper recommends that the Fed auction liquidity options for use in a crisis in a manner that credibly commits not to engage in any other *ad hoc* lending to nonbanks.

The ideas of this paper might be extended to deposit insurance and the banking system. It is hard to imagine that insurance of \$250,000 per depositor per bank is in any sense optimal with respect to reducing systemic risk and moral hazard. A better approach could be to determine an appropriate total quantity of deposit insurance to be outstanding at any time and to auction that quantity to eligible banks. This approach might also lead to a unification of the policies pertaining to deposits and to deposit-like assets.

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- ¹ The tri-party repo market is the main source of short-term funding for investment banks. For a description of the market, see, for example, Tuckman (2010).
- ² See Keister (2010) for proposing to address the same problem by taxing or limiting short-term liabilities.
- ³ Overnight repo and open repo, which constitute the vast majority of the repo funding market, offer daily liquidity. Money market fund accounts offer daily liquidity as well.
- ⁴ See, for example, Friedman (2010).
- ⁵ Board of Governors, "Federal Reserve Announces Establishment of Primary Dealer Credit Facility." The initial list of eligible collateral included securities eligible for open market operations (Treasuries, agencies, and agency MBS) as well as investment grade corporates, municipals, MBS, and ABS for which prices are available.
- ⁶ Fleming, Hrungr, and Keane (2009). See also, "Board announces several initiatives to provide additional support to financial markets," Board of Governors of the Federal Reserve. The initial list of eligible collateral included Treasuries, agencies, and AAA-rated MBS and ABS.
- ⁷ For a description of the fed funds rate, see Tuckman and Serrat (2012), pp. 417-419.
- ⁸ Adrian, Burke, and McAndrews (2009), p. 8.
- ⁹ Author's calculations based on data from the Board of Governors of the Federal Reserve.
- ¹⁰ Author's calculations based on data from the Board of Governors of the Federal Reserve.
- ¹¹ More precisely, the Fed suffers a loss when the borrower defaults and the value of the collateral falls by more than the haircut. See, for example, Tuckman and Serrat (2012), p. 330.
- ¹² Author's calculations based on data from the Federal Reserve Bank of New York.
- ¹³ McDermid and Barr (2008).
- ¹⁴ For the PDCF see Adrian, Burke, and McAndrews (2009), p. 4. For the TSLF see Board of Governors, "Board announces several initiatives to provide additional support to financial markets."
- ¹⁵ Author's calculations based on data from the Board of Governors of the Federal Reserve.
- ¹⁶ Condon (2008).
- ¹⁷ Data are from the Investment Company Institute and author calculations. The standard deviation of weekly changes in balances from January 2, 2008, to September 10, 2008, was about \$20 billion.
- ¹⁸ For further discussion of the role of sponsor support, see Moody's Investors Service (2010).
- ¹⁹ Flow of Funds Accounts, Board of Governors of the Federal Reserve.
- ²⁰ These data on commercial paper outstanding and its maturity structure are from the Board of Governors of the Federal Reserve System.
- ²¹ Anderson and Gascon (2009), Table 2, p. 594.
- ²² Adrian, Kimbrough, and Marchioni (2011), p. 29
- ²³ Bracewell & Giuliani (2008). The initial program was actually set to expire on April 30, 2009, with an optional extension through September 2009 at the discretion of the Secretary of the Treasury.
- ²⁴ Paulson (2010), p. 263. Interestingly, this "virtually 100 percent" claim and the order-of-magnitude calculations in the next footnote imply that government-only funds, which constituted about \$1.2 trillion of the \$3.5 trillion total, participated to a very large extent as well. For some anecdotal evidence, with reference to Vanguard's Admiral Treasury Money Market Fund, see Vanguard (2008).
- ²⁵ U.S. Department of the Treasury (2009). Checking that the orders of magnitude make sense, Investment Company Institute data show that total money market fund balances were about \$3.5 trillion at the end of September 2008. Hence, a quarterly fee of 1 basis point on all of those balances would, over the year of the program, have produced fee income of \$1.4 billion while that fee on 86% of balances would have produced the actual fee income of \$1.2 billion.
- ²⁶ See Adrian, Kimbrough, and Marchioni (2011). In September 2008 the Fed also launched the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF), which loaned money to banks to finance the purchase of asset-backed commercial paper from money market funds. This program was relatively small, however, peaking early in its operation at slightly over \$30 billion.
- ²⁷ Adrian, Kimbrough, and Marchioni (2011), p. 38.
- ²⁸ See www.newyorkfed.org/markets/cpff_terms_conditions.html
- ²⁹ Dodd-Frank, Section 1101.
- ³⁰ Acharya *et al.*, pp. 226-228.
- ³¹ See, for example, Paulson (2010), p. 116.

³² Securities and Exchange Commission (2010).

³³ More specifically, the new rule reduces the weighted-average-life maturity of portfolios; tightens restrictions on holdings of lower quality securities; tightens restrictions on non-government repo investments; reduces the fraction of portfolios that can be invested in a single issuer; imposes minimum percentage investments in highly-liquid securities; tightens restrictions on holdings of illiquid securities; requires funds to model redemptions, conduct market stress tests, and manage repo counterparty risk.

³⁴ The same criticism applies to proposals, not discussed in this paper, for money market funds under stress to redeem shares in kind, i.e., with the delivery of *pro rata* amounts of assets. These proposals also fail to explain why investors would not liquidate assets delivered to them and why such liquidations would be systemically safer than the professionally-managed funds liquidating assets directly. See Investment Company Institute (2009), p. 119.

³⁵ Anderson and Gascon (2009), p. 604.

³⁶ President's Working Group on Financial Markets (2010), p. 16.

³⁷ See Poszar (2011), p. 24; Securities and Exchange Commission, "Unofficial Transcript: Roundtable on Money Market Funds and Systemic Risk, comments of Brian Reid, Travis Barker, Lance Pan, and Kathryn L. Hewitt, pp. 14-16.

³⁸ From this viewpoint, much of the securitization leading up to the crisis was to expand the supply of deposit-like assets or short-term assets that could be transformed by money market funds into deposit-like assets.

³⁹ President's Working Group on Financial Markets (2010), p. 21

⁴⁰ Task Force on Tri-Party Repo Infrastructure (2010), pp. 9, 26-27.

⁴¹ See, for example, President's Working Group on Financial Markets (2010), sections 3b and 3d.

⁴² See, for example, Investment Company Institute (2009), pp. 112-114.

⁴³ See, for example, President's Working Group on Financial Markets (2010), sections 3a, 3e, and 3f. Also see Squam Lake Group (2011).

⁴⁴ See, for example, President's Working Group on Financial Markets (2010), section 3g. Also see Squam Lake Group (2011).

⁴⁵ Ultra-short bond funds are floating NAV funds that are similar, although certainly riskier than fixed NAV money market funds. Investment Company Institute (2009), p. 105, reports that, "in February and March 2008, several ultra-short bond funds posted significant NAV declines, and the average NAV on all these funds fell about 2 percent. During the four weeks ending in early April, ultra-short bond funds experienced a cumulative outflow of 15 percent of assets."

⁴⁶ See the following. 1) European Fund and Asset Management Association (2009), p. 9: "The first impact of the financial crisis became apparent in August 2007 with the outbreak of the subprime crisis due to the relative importance and success of the so-called enhanced money market funds. In a matter of weeks, €70 billion were redeemed in funds predominantly from institutional investors; around 15-20 suspended redemptions for a short period, 4 of them were definitively closed." 2) McGonigle (2011), p. 3: "According to information provided by Strategic Insight, when measured as a percentage of net assets, total net redemptions from floating NAV money market funds in Europe in September and October 2008 were only 1% less than total net redemptions from stable NAV money market funds during the same period." 3) Investment Company Institute (2009), p. 106: "... in the summer of 2007, French floating NAV dynamic money funds... began to suffer significant investor outflows when problems in the credit markets from exposure to U.S. subprime mortgages surfaced... A year later, European bond funds similarly suffered heavy outflows... [I]n the fourth quarter of 2008, bond funds authorized in Luxembourg experienced outflows of €48 billion, or 12 percent of their assets, even though the funds had valuation declines of about 3 percent." 4) Securities and Exchange Commission (2011), comments of Brian Reid on pp. 5 and 30, and comments of Travis Barker on pp. 16 and 29. Quoting Travis Barker, p. 29: "...the German money market fund sector, which is a variable NAV sector... had a run from their funds... Bundesbank even offered a statement of support which effectively halted that run."

⁴⁷ As for the latter, see Investment Company Institute (2009), pp. 27-28, 105-112, and Appendix D.

⁴⁸ For a sample cost of capital calculation, see McGonigle (2011), pp. 8-9.

⁴⁹ Some analyses, for example, attribute some blame for the S&L crisis of the 1970's to deposit insurance. For a discussion of moral hazard and deposit insurance across countries, see Demirgüç-Kunt and Kane (2002), pp. 175-195.

⁵⁰ Securities and Exchange Commission (2011), comment of John D. Hawke, Jr., p. 26.

⁵¹ Candidate criteria for defining diversification would include the percentage of the portfolio in the largest and in the first two largest issuers; the number of defaults with a given recovery rate that would not eat through the haircut; etc.

⁵² This notation is consistent with that of the swaptions market, where a 5y10y swaption is the right, in five years, to enter into a 10-year swap.

⁵³ There is, of course, some counterparty risk. Should the lender of term funds default, the borrower would have legal right to the collateral but, in practice, might have trouble recovering the asset.

⁵⁴ See Tuckman (2010b), Acharya *et al.* (2011), pp. 229-231, and Duffie and Skeel (2011).

⁵⁵ See www.frbdiscountwindow.org/index.cfm

⁵⁶ See www.newyorkfed.org/markets/pdcf_terms.html

⁵⁷ See www.newyorkfed.org/tripartyrepo/margin_data.html

⁵⁸ The discussion with respect to the tri-party repo system is complicated by the fact that this system currently sits inside banks that conduct other business.

⁵⁹ See newyorkfed.org/aboutthefed/fedpoint/fed18.html .

⁶⁰ See Fleming, Hrungr, and Keane (2009), p. 9.

⁶¹ Money market fund and commercial paper balances can be found in the Flow of Funds Accounts, Board of Governors of the Federal Reserve.

⁶² Source: Tri-Party Repo Statistics, Tri-Party Repo Infrastructure Reform Task Force, on the website of the Federal Reserve Bank of New York.

⁶³ The author thanks Larry Bernstein for suggesting the possibility of private-sector participation.

⁶⁴ Source: Tri-Party Repo Statistics as of 12/9/2011 from the Federal Reserve Bank of New York and author's calculations.