

Replumbing Our Financial System: Uneven Progress*

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The financial crisis of 2007–09 has spurred significant ongoing changes in the “pipes and valves” through which cash and risk flow through the center of our financial system. These include adjustments to the forms of lender-of-last-resort financing from the central bank and changes the infrastructure for the wholesale overnight financing of major dealer banks, particularly through the tri-party repo markets. Significant changes in the regulation of money-market funds are under consideration. The Dodd-Frank Act mandates the central clearing of standardized over-the-counter derivatives, although a pending exemption of foreign exchange derivatives remains to be decided. The vulnerability of major dealers to runs by prime-brokerage clients is also an issue to be addressed. I focus on U.S. financial plumbing and on areas where financial stability remains a concern.

JEL Codes: G01, G21, G28.

1. Introduction

Weaknesses in the “plumbing” of the financial system that came to light during the financial crisis of 2007–09 have prompted reforms that are ongoing. On the path toward greater financial stability,

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progress has been uneven. My objective here is to focus on some weaknesses that remain.

“Plumbing” is a common metaphor for institutional elements of the financial system that are fixed in the short run and enable flows of credit, capital, and financial risk. This institutional structure includes some big “valves and pipes” that connect central banks, dealer banks, money-market funds, major institutional investors, repo clearing banks, over-the-counter (OTC) derivatives central clearing parties, and exchanges. The connectors include lending facilities offered by central banks to each other and to dealer banks, tri-party repo and clearing agreements, OTC derivatives master swap agreements, prime-brokerage agreements, and settlement systems arranged through Fedwire, the Clearing House Interbank Payments System, CLS Bank, the Depository Trust Company, and other major custodians and settlement systems.

The institutional framework depends on regulations. Largely because of changes in financial regulation, we are heading toward a safer financial system. Of primary importance in this progress are improvements in capital and liquidity requirements for regulated banks, although these are not my main focus here. Improvements in the plumbing of the financial system, however, have in some areas been partial or halting.

Just as the wider economy depends on an effective financial system for transferring credit, capital, and risk among ultimate economic actors, the internal effectiveness of the financial system depends on the proper functioning of financial infrastructure. At the onset of a financial crisis, institutional arrangements that are fixed in the short run determine the scope for discretionary action, of both harmful and risk-reducing types. Some of these arrangements, such as central bank emergency liquidity facilities, are only activated during a crisis. Plumbing elements should not only be resilient to stresses such as the defaults of interacting entities; they should also be placed and designed so as to permit the sorts of transfers that may be needed in a crisis.

Typical approaches to financial risk management that balance failure risk against away-from-failure operating efficiency should, in my view, be fully recalibrated for applications to certain key financial market infrastructure. Although regulators are working toward a world that can more easily tolerate the failure of large financial

institutions, I doubt that we should view some of the key financial infrastructure in the same way. Obviously there should be effective failure-management plans for repo clearing facilities and OTC derivatives central clearing parties (CCPs), but the public interest suggests that these kinds of utilities should be designed, regulated, and managed with the objective that it is extremely difficult for them to fail catastrophically. The expected spillover costs of the failure of large financial utilities such as these are significant relative to the costs of safer designs. Moreover, the threat of their potential failure can lead financial market participants to react defensively in ways that destabilize markets. Considering as well the narrow scope for moral hazard associated with dedicated financial market utilities, my view is that we can afford to design and regulate some of these utilities as though they are “too important to fail.” If that is the case, the operations and capital structure of these utilities should not be entangled with those of larger and more complex financial institutions, especially if there is an intention to let those financial institutions fail whenever they cannot meet their obligations.

In the course of this overview, I will focus on the following policy issues:

- The emergency plumbing available to the Federal Reserve has changed. We are now in an environment in which the importance of emergency access to a secured lender of last resort is widely recognized but is available for a systemically important non-bank financial institution under a limited and potentially shrinking set of circumstances. Events could some day arise in which it would be difficult for the central bank to provide effective emergency liquidity.
- Given the systemic importance of tri-party clearing agents, and given their high fixed costs and additional economies of scale, tri-party repo clearing services for U.S. dealers and cash investors should probably operate through a dedicated regulated utility. Although this would likely increase operating costs for market participants, it would enable investment in more advanced clearing technology and financial expertise, allowing greater resilience of the tri-party repo market in the face of financial shocks such as the default of a major dealer. The moral hazard associated with lending of last resort to

a dedicated utility is much reduced relative to the case of a financial institution with a wide scope of risk-taking activities.

- Large institutional investors in money-market funds are prone to run in the face of losses. Systemically important borrowers such as dealer banks remain dependent on short-term financing from money-market funds, particularly through tri-party repos. The Securities and Exchange Commission (SEC) is considering new regulatory requirements for money-market funds, such as capital buffers and redemption gates, with the goal of lowering the risk of runs by money-market fund investors. Further reform of money-market funds is indeed necessary for financial stability. The unintended consequences of the reform of money-market funds, however, may include a shift to other forms of run-prone wholesale short-term lending to critical borrowers. Close principles-based supervision of systemically important short-term wholesale financing will also be needed.
- Central clearing parties for OTC derivatives are proliferating. This risks a significant and unnecessary rise in counterparty exposures as well as the dilution of regulatory oversight across many CCPs. Competition among CCPs could involve reduced membership requirements for collateral. Fewer CCPs, each closely supervised, should be a goal. To this end, arrangements should be made for the cross-jurisdictional regulatory supervision of CCPs wherever possible, with clear assignment of regulatory responsibilities and lines of access to central bank liquidity support. Regulatory minimum margin standards should be strong and harmonized. Effective plans for dealing with the failure of a CCP are yet to be established, to my knowledge.
- If it is agreed that the central clearing of standardized OTC derivatives is an important source of financial stability, there is every reason to include foreign exchange (FX) derivatives in the requirement for central clearing, or some effective substitute. FX derivatives have been exempted from clearing and most other major new regulations of the swap market, which include collateral standards for uncleared positions, trade execution in swap execution facilities, trade recording in swap data repositories, and post-trade transaction reporting.

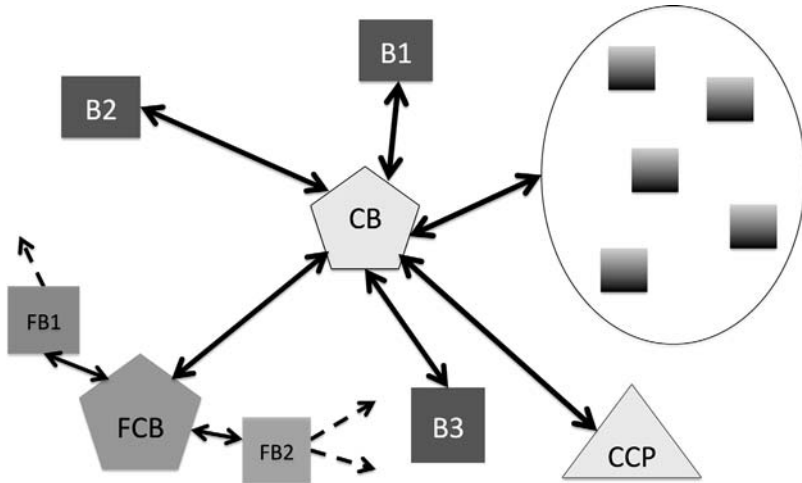
- Prime brokerage was revealed to be an important weak link in the financial system immediately after the failure of Lehman Brothers in 2008. Rule 15-c-3 of the U.S. Securities Exchange Act of 1934 had appeared to safely limit the dependence of a U.S. dealer for liquidity on its prime-brokerage business. It did not. The United Kingdom had almost no regulatory standards on this dimension. Morgan Stanley suffered a firm-threatening loss of liquidity due to a sudden run by its prime-brokerage hedge-fund clients in both the United States and the United Kingdom after the failure of Lehman Brothers. An in-depth forensic analysis of the mechanics of this run is warranted. The lessons learned should be published and used to revise Rule 15-c-3 and to improve the regulatory treatment of prime brokerage in London and emerging global financial centers.

2. Changes in Central Bank Plumbing

Before the financial crisis of 2007–09, central bank liquidity was provided to financial markets mainly through normal monetary operations conducted through primary dealers, and through limited forms of lender-of-last-resort financing. The latter included secured lending through the discount window to regulated banks as well as the potential emergency secured lending to essentially any market participant under Section 13(3) of the Federal Reserve Act. The Dodd-Frank Act now restricts “13(3)” emergency financing to a “program or facility with broad-based eligibility.” Thus, individual non-bank firms can no longer obtain emergency financing directly from the central bank.

Because of the extreme stresses of the financial crisis, the Federal Reserve set up a range of broad lender-of-last-resort programs and facilities, such as the Primary Dealer Credit Facility (PDCF), the Term Auction Facility (TAF), the Money Market Investor Funding Facility (MMIFF), the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, the Commercial Paper Funding Facility (CPFF), and the Term Asset-Backed Securities Loan Facility (TALF). These programs would presumably have met the statutory criterion, had it applied at the time, of “broad-based eligibility.” They played a crucial role in mitigating the severity of the financial crisis of 2007–09. Versions of these facilities could be resurrected in a future crisis.

Figure 1. Lines of Emergency Liquidity Provided by a Central Bank



Note: The figure shows lines of emergency liquidity provided by a central bank, through the discount window to domestic banks, indirectly to foreign banks through central bank currency swap lines, through a “program or facility with broad-based eligibility” such as the Primary Dealer Credit Facility, and to a financial market utility under Title VIII of the Dodd-Frank Act.

In addition, as illustrated in figure 1, in 2007 the Federal Reserve set up “currency swap lines” that provided dollar liquidity to foreign central banks.¹ These currency swap lines enable a foreign central bank to provide lender-of-last-resort financing in dollars to banks within in its own jurisdiction, and in principle allowed the Federal Reserve to give U.S. banks access to foreign currencies. Because of

¹The 2009 swap lines were authorized for the Reserve Bank of Australia, the Banco Central do Brasil, the Bank of Canada, Danmarks Nationalbank, the Bank of England, the European Central Bank, the Bank of Japan, the Bank of Korea, the Banco de Mexico, the Reserve Bank of New Zealand, Norges Bank, the Monetary Authority of Singapore, Sveriges Riksbank, and the Swiss National Bank. These swap lines were wound down in February 2010 but were reopened in May 2010 to a subset of the same central banks, the Bank of Canada, the Bank of England, the European Central Bank, the Bank of Japan, and the Swiss National Bank. Temporary foreign-currency swap lines, mirroring the dollar-currency swap lines, were set up in April 2009, terminated in February 2010, and reinstated in November 2011.

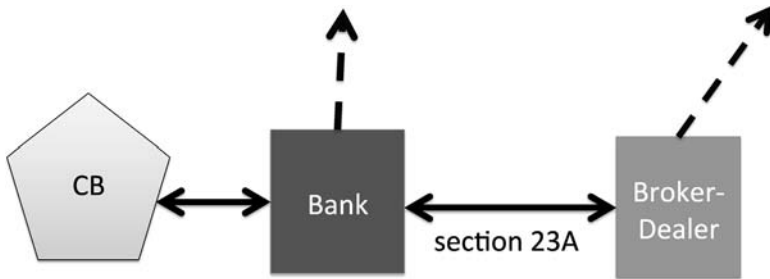
the “reserve-currency” status of the U.S. dollar, global financial stability depends on global access to emergency secured loans of last resort in dollars. With the innovation of these currency central bank swap lines, the U.S. central bank has improved financial stability while allowing foreign central banks to monitor and absorb the credit risk of the banks to which the dollars ultimately flow. That these currency swap lines have been a useful addition to the plumbing of the financial system was demonstrated during the 2007–09 crisis and more recently during the euro-zone debt crisis.

Title VIII of the Dodd-Frank Act allows the central bank to provide liquidity support to financial market utilities such as central clearing parties. The ability to take advantage of this emergency secured lending to stabilize a financial market utility (FMU) depends in part on the default-management plan of the FMU. Because of the nature of its balance sheet, a CCP may have a limited set of assets to post as collateral to the central bank by the time of its near failure or failure. As opposed to the case of a large bank, there would be no large class of unsecured creditors to absorb losses. The counterparties of a CCP are typically systemically important themselves. Because of these concerns, Duffie and Skeel (2012) point to the potential importance of a short stay on the OTC derivatives of a CCP at its bankruptcy, or at its resolution under Title II of the Dodd-Frank Act.

The ability of the Federal Reserve to provide indirect liquidity to affiliates of regulated banks, such as broker-dealers, is limited by Section 23A of the Federal Reserve Act, which restricts transactions between a bank and its affiliates, as illustrated in figure 2. Omarova (2011) argues that during the financial crisis of 2007–09, Section 23A included sufficient exemptive power for the Federal Reserve to provide substantial emergency liquidity. The Dodd-Frank Act, however, has placed significant additional restrictions on “23A transactions.” Section 23A and Section 23B still provide some scope for exemptive liquidity provision, subject however to a finding by the Federal Deposit Insurance Corporation that the exemption does not place the Deposit Insurance Fund at risk, among other requirements.

In summary, if a systemically important non-bank market participant is threatened by a liquidity crisis, lender-of-last-resort secured financing from the Federal Reserve can now be obtained only under broad programs or indirectly via the new version of Section 23A,

Figure 2. Limitations of a Bank Affiliate's Access to Indirect Lender-of-Last-Resort Secured Financing



Note: The schematic shows the access of a bank affiliate, such as a broker dealer, to indirect lender-of-last-resort secured financing through its bank affiliate, as limited by Sections 23A and 23B of the Federal Reserve Act.

which is generally more restrictive. Even assuming that a broad program could be arranged quickly enough in an emergency situation, the design of such a program places a central bank under some stress. Depending on the breadth of eligibility of such a program, the central bank could be accused of exceeding its mandate. If the program is aimed broadly but few borrowers ultimately participate, the same concerns could be raised, whether or not they are legitimate. Some of the targeted market participants might hold back in the face of concerns over stigma regarding their need for funding or over the potential for expectations by the public or some public officials of quid pro quo behavior by the borrower.

Among other implications, the new and more limited scope for lender-of-last-resort financing to non-banks merits attention, given the potential for new regulations such as the Volcker Rule to incite the emergence of large broker-dealers that are not affiliates of bank holding companies.² If that were to occur, significant quantities of collateral would be placed further from access to lender-of-last-resort financing. These assets may include, for example, over-the-counter derivatives and foreign assets held on the balance sheets of U.S. banks and bank subsidiaries. Section 23A provides an exception for derivatives. Of the five major U.S. bank holding companies operating

²See Duffie (2012).

OTC derivatives dealers—JP Morgan, Bank of America, Goldman Sachs, Citigroup, and Morgan Stanley—all but Morgan Stanley keep most of their OTC derivatives on the balance sheets of the respective regulated banks. The Edge Act allows classes of foreign assets to be held by subsidiaries of U.S. banks, where 23A restrictions are less onerous. For a broker-dealer unaffiliated with a bank, access to a lender of last resort through transactions allowed under Section 23A (and its exemptions) is irrelevant, and only broad programmatic emergency lending would be available. This issue also elevates the importance of strong capital and liquidity standards for non-bank financial firms, which do not fall under the scope of the Basel III process.

3. Tri-Party Repo, Dealer Liquidity, and Money-Market Funds

A repurchase agreement, or “repo,” is in essence a secured loan.³ A delivery-versus-payment (DVP) repo is arranged through direct transfers between borrower and lender of cash and securities. A substantial quantity of repos are instead arranged in the tri-party market, which is serviced by two clearing banks, JP Morgan Chase and Bank of New York Mellon.

The tri-party repo market is the source of over \$100 billion in overnight financing to each of several major U.S. dealer banks. The aggregate quantity of repos handled by this market was \$1.74 trillion in February 2012.⁴ Money-market funds and securities lenders are major sources of cash lending. Some of these cash lenders lack the operational or regulatory capability to conduct DVP repos. As illustrated in figure 3, in order to obtain this form of financing, a dealer bank places collateralizing securities in the clearing-bank account of its cash lender. Each dealer depends crucially on the willingness of its clearing bank to facilitate this lending. In particular, when

³The main distinction, an important one, is that repos are not subject to bankruptcy stays or preference rules. See Duffie and Skeel (2012).

⁴These data are reported regularly at the web site of the Tri-Party Repo Infrastructure Reform Task Force, maintained at the Federal Reserve Bank of New York.

Figure 3. Tri-Party Repurchase Agreement between Cash Investor and Dealer Bank



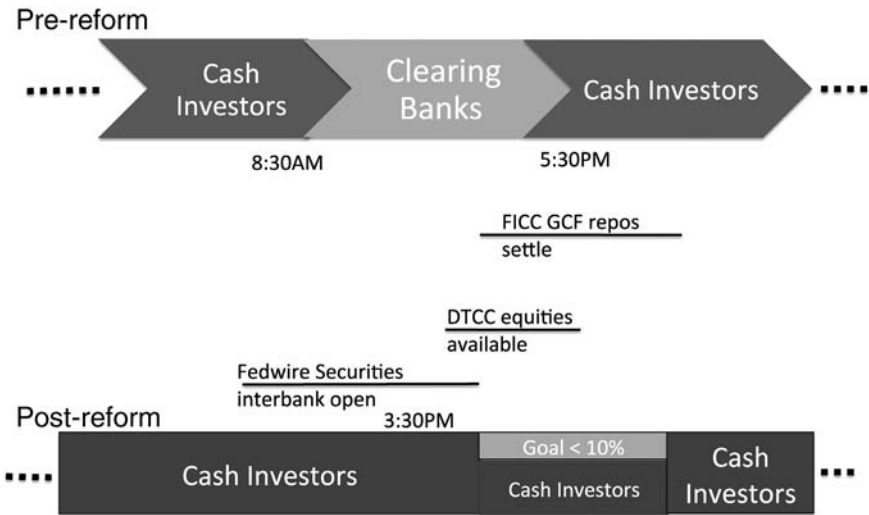
Note: This figure shows a tri-party repurchase agreement between a cash investor, such as a money-market fund, and a dealer bank. A clearing bank acts as an agent for the trade.

the repos mature each day, the clearing bank offers intraday financing to the dealer for its securities until the dealer and clearing bank have completed the allocation of the dealer's collateral into new repo financing from cash lenders.

Reforms of the tri-party market infrastructure have been slow. The senior industry task force charged with implementing these reforms brought their work to a halt in February 2012, incomplete. In its "Statement on the Release of the Tri-party Repo Infrastructure Reform Task Force's Final Report," released on February 15, 2012, the Federal Reserve Bank of New York, the primary regulator of the tri-party repo market, stated that "the amount of intraday credit provided by clearing banks has not yet been meaningfully reduced, and therefore, the systemic risk associated with this market remains unchanged." Among the upgrades of tri-party infrastructure that remain to be implemented are more automated collateral substitution and collateral allocation processes. These would allow a smoother and safer rolling of maturing repos into new repos.⁵ The objectives of the reforms undertaken by the tri-party repo industry task force are illustrated in figure 4. The main accomplishment to this point is to reduce the portion of the day over which the clearing banks provide secured credit to dealers. These reforms are still hampered by insufficient automation and by timing of repo unwinds relative to the completion of transfers of collateralizing securities

⁵See Copeland et al. (2012).

Figure 4. Objectives of Reforms Undertaken by Tri-Party Repo Industry Task Force



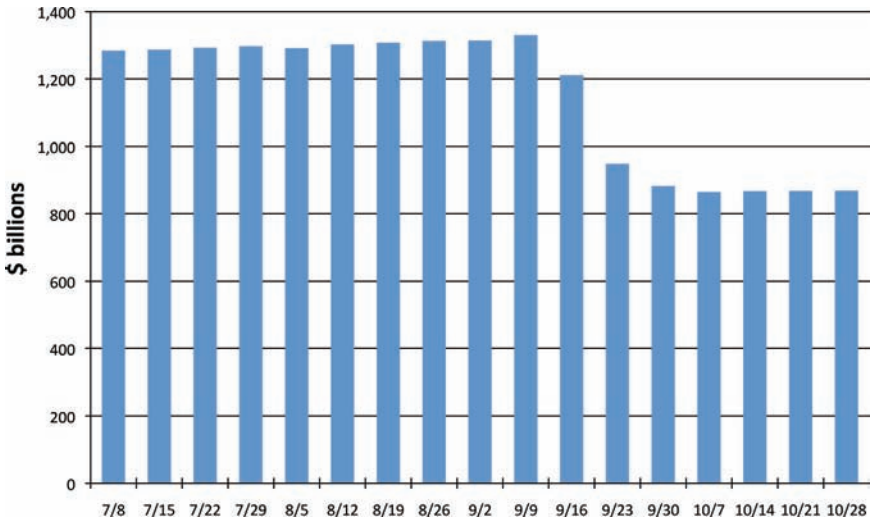
Note: This figure shows ongoing adjustments in the daily unwind and rewind of tri-party repos, with the main objective of lowering the exposure of a clearing bank to intraday credit risk.

through Fedwire, the Depository Trust & Clearing Corporation, and the Fixed Income Clearing Corporation.

Institutional investors in money-market mutual funds, in the face of any concerns over the exposures of their money-market funds to dealers, are apt to immediately redeem their money-market fund shares. Institutional investors treat their money-market fund shares as though they are cash; any loss relative to the normal price of one dollar per share is viewed by these investors as essentially unacceptable. Indeed, when the Reserve Primary Fund “broke the buck” on September 16, 2008, through its exposure to Lehman Brothers, there was a general industry-wide run by institutional investors in prime money-market funds, amounting to roughly 40 percent of their funds over a two-week period.⁶ This run, illustrated in figure 5, would have

⁶From September 9, 2008 to September 23, 2008, holdings by institutional investors in prime money-market funds dropped from \$1,330 billion to \$948 billion. These are estimates provided by Moody’s.

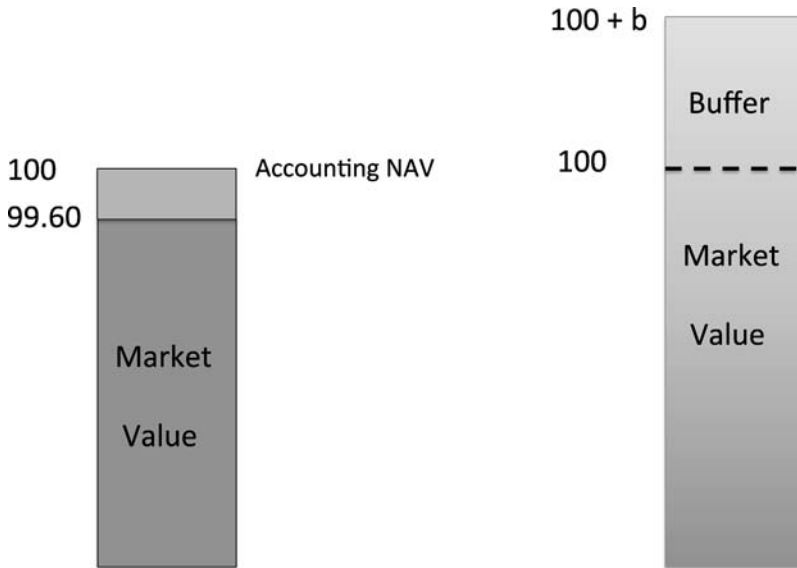
Figure 5. Industry-Wide Run by Institutional Investors in Prime Money-Market Funds



Notes: This figure shows institutionally held assets in prime money-market mutual funds in the weeks of 2008 surrounding the collapse of Lehman Brothers; the “breaking of the buck” of the Reserve Primary Fund on September 16, 2008; and the announcement of a U.S. Treasury guarantee of money-market mutual funds on September 18, 2008. The underlying data are from Moody’s Investor Services.

continued but for the prompt action of the U.S. Treasury on September 18, 2008, to guarantee all money-market funds. Such a guarantee by the government is considered to be no longer permissible, absent congressional action. Since the financial crisis of 2007–09, Rule 2a7 of the Securities Exchange Act significantly tightened the quality and liquidity requirements of money-market funds. In my opinion, Rule 2a7 should be further improved by diversification requirements. For example, in the summer of 2010, the top-five exposures of U.S. prime money-market fund assets were all to European banks, with each of the five banks representing an exposure of at least 2.5 percent of aggregate fund assets.⁷

⁷See Shilling (2010). These top-five exposures, as a fraction of total Prime MMF Assets, were to BNP Paribas (3.5 percent), Société Générale (3.0 percent), Crédit Agricole (2.7 percent), Lloyds (2.7 percent), and Banco Bilbao Vizcaya Argentaria (2.5 percent).

Figure 6. Squam Lake Group Recommendation

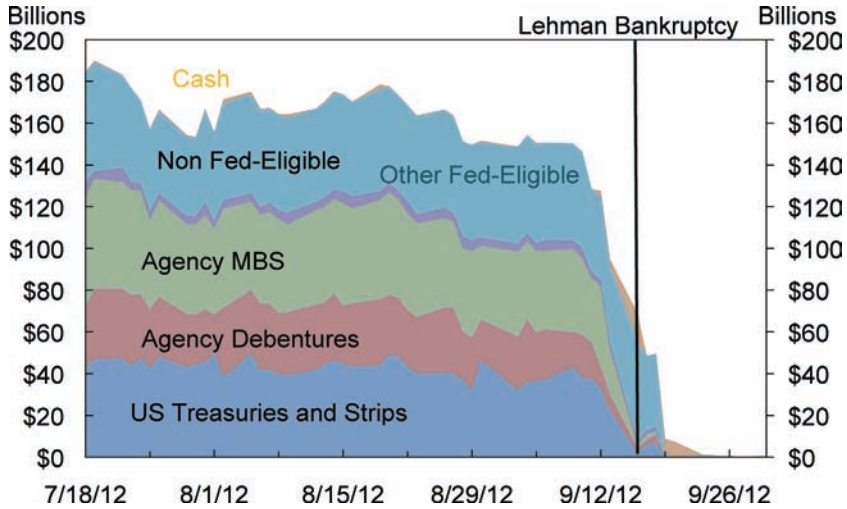
Note: This figure illustrates the recommendation of the Squam Lake Group to have money-market shares trade at a price that is marked to the current market value of the fund's assets or, alternatively, for money-market funds to be buffered against loss.

As illustrated in figure 6, the Squam Lake Group (2011) recommended that money-market funds be required to have their shares marked to market or, alternatively, that money-market funds have loss buffers of some form, such as third-party insurance or overcollateralization.⁸ The SEC is preparing a recommendation for further regulation of money-market funds.

The tri-party market infrastructure, the heavy reliance of major dealers on short-term financing, and the current design of money-market funds, collectively present several sources of systemic risk:

⁸Currently, money-market funds are permitted to have their share prices recorded on a "book-accounting" basis and rounded to the nearest penny per share. This amounts to a constant share price of one dollar, until the money-market fund suffers a significant loss and "breaks the buck." See Squam Lake Group (2011). I am a member and coauthor.

Figure 7. Quantities of Assets of Various Classes Financed by Lehman Brothers through Tri-Party Repos (in days surrounding Lehman's failure)



Source: Copeland, Walker, and Martin (2011), Federal Reserve Bank of New York.

- A dealer whose solvency or liquidity comes into question may be unable to find cash lenders that are willing to roll over a sufficient quantity of its repos. In that case, concerns over a dealer's liquidity might be self-fulfilling. The dealer could fail, or its securities might need to be liquidated in a fire sale, or both. Figure 7 illustrates the rapid reduction of Lehman's tri-party repo book around the time of its failure, based on data from the Federal Reserve Bank of New York.
- A fire sale of a dealer's securities caused by the dealer's inability to roll over its repo financing on a given day could temporarily depress the prices of some of the affected classes of securities, particularly those securities that lack transparency or whose creditworthiness depends on the stability of the financial sector. This could have spillover effects to other dealers and more broadly.
- Between the unwinding of the previous day's repos and the roll into the next day's repos, money-market funds and other cash

investors' claims are in the form of demand deposits at the clearing bank. In extreme scenarios and in the absence of sufficient transparency, cash investors could become concerned that a clearing bank could be destabilized by its intraday secured-lending exposure to a dealer. A run of these intraday demand deposits could indeed destabilize the balance sheet of a clearing bank in the worst case. Access to intraday lender-of-last-resort financing to the clearing bank from the Federal Reserve could depend in part on the mix of collateralizing assets.

- In light of such concerns, a clearing bank could fail to provide intraday financing to a dealer. At current magnitudes, the loss of this financing could be life threatening to a dealer.
- Institutional investors in money-market funds, harboring any concerns about losses, could run indiscriminately as in 2008, forcing the managers of even those money-market funds that are in good financial condition to sharply reduce their cash lending to even the safest dealers. Through a combination of the other effects mentioned above, this could “spiral” into a severe lack of liquidity at the center of the financial system.

These weaknesses point to the importance of the liquidity of collateral used in the tri-party repo market. Currently, approximately 80 percent of the collateral used in the tri-party repo market consists of Treasuries or agencies (including agency debentures, agency mortgage-backed securities, and agency collateralized mortgage obligations) that are eligible as collateral for financing from the Federal Reserve. The largest classes on non-Fed-eligible assets used in the tri-party market are corporate bonds and equities, which each constitute approximately 5 percent of the total, as of February 2012.⁹

The new Basel III requirements for liquidity coverage ratios are likely to be effective at forcing regulated financial institutions to maintain a reduced dependence on short-term repos for financing their securities inventories. Some consideration should be given to

⁹The share of equities in the total has dropped substantially in the past year. The source of these data is the web site of the Tri-Party Repo Infrastructure Reform Task Force, which is maintained at www.newyorkfed.org.

parallel regulatory requirements for non-bank systemically important wholesale cash borrowers.

Given the systemic importance of tri-party clearing, and its high fixed costs and other sources of economies of scale, tri-party repo clearing services for U.S. dealers and cash investors should probably operate as a regulated utility. Although this would likely increase operating costs for market participants, it would enable the investment in more robust clearing technology and lead to a more resilient wholesale funding market for dealer banks. It is not yet clear whether the better design is based on a clearing agent that facilitates bilateral repos, or on a central clearing facility that acts as a direct counterparty to each member participant. The current market for access to tri-party repo services seems to have led to a level of investment in infrastructure that reflects a significant wedge between costs that can be captured through pricing by the service providers and total costs to the broader economy, including those associated with systemic risk. A dedicated regulated monopoly could improve this situation. Further, the possibility that risks unrelated to repo clearing could threaten one of the banks currently operating systemically crucial repo facilities is not a good choice, in my opinion. As unlikely as such a failure may be, the systemic importance of a tri-party repo clearing facility unnecessarily raises the systemic importance of the bank that operates the facility. This could increase moral hazard, and in any case runs counter to suggestions by some that the United States is now in a position to safely force any large financial institution into failure resolution. A dedicated tri-party repo utility would also be relatively more transparent to its users and its primary regulator.

4. Central Clearing of Over-the-Counter Derivatives

A derivatives contract is “cleared” when the performance of the buyer and the seller is effectively guaranteed by a special-purpose financial utility known as a central clearing party (CCP). A CCP becomes the buyer to each seller and the seller to each buyer. Central clearing is suitable for standardized derivatives, those which are sufficiently widely traded to be safely and efficiently handled by a CCP.

A key element of the new regulatory approach to financial stability is the central clearing of standardized derivatives, which is mandated (with exceptions) by Title VII of the Dodd-Frank Act and by comparable regulation in most G20 countries. Effective clearing mitigates systemic risk by lowering the risk that defaults propagate from counterparty to counterparty. Such a chain reaction did not occur during the financial crisis of 2007–09, but this may be partly due to a decision to “bail out” AIG over its losses on OTC derivatives positions. (In any case, the AIG derivatives were too customized to be handled safely by a CCP.) Clearing also reduces the degree to which the solvency problems of a market participant are suddenly compounded by a flight of its OTC derivative counterparties, such as when the solvency of Bear Stearns and Lehman Brothers was in question. Central clearing further promotes financial stability through improved transparency into counterparty credit risk. With a well-regulated CCP, market participants and regulatory supervisors should be in a better position to judge counterparty risk and default-management capabilities. They can better monitor the uniform application of collateral requirements on all members. The scope of potential forms of risk-taking and failure mechanisms of CCPs are limited relative to those of a large dealer bank, the main alternative type of counterparty, given that essentially all over-the-counter derivatives are first negotiated with a major dealer.

Central clearing, if it covers a sufficient amount of derivatives trade and is conducted at sufficiently few CCPs, also lowers average counterparty risk through the effect of netting, as illustrated in figures 8 and 9, and as modeled by Duffie and Zhu (2011).

The U.S. Treasury Department has proposed to exempt foreign exchange derivatives from recent regulatory requirements for over-the-counter derivatives, including clearing, trade competition, and minimum collateral requirements. In my opinion, the arguments that have been made for such an exemption are not sufficient.

Major participants in the FX derivatives market have strongly resisted the clearing of counterparty default exposures. They correctly emphasize that, as opposed to derivatives that are settled by a payment of only the net market value of the contract, a large fraction of FX derivatives are settled when each of the two parties pays the gross amount of the currency due on its side, through a payment-versus-payment procedure at CLS Bank. A conventional approach

Figure 8. Reductions in Counterparty Exposure through Netting at a Central Clearing Party

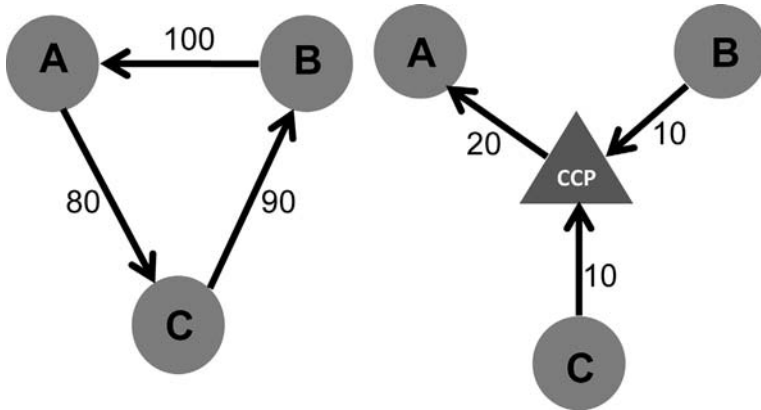
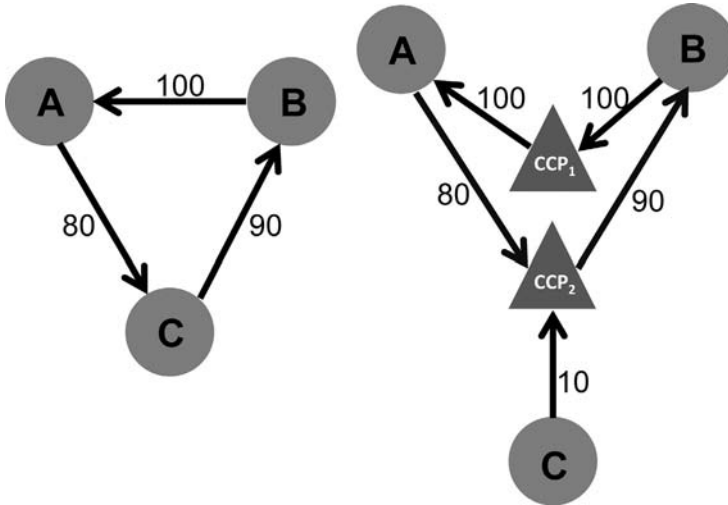


Figure 9. Increase in Counterparty Exposures from a Proliferation of CCPs



to clearing FX derivatives might therefore entail some special operational risks or costs. For example, if CLS were to clear counterparty default exposures and as a result be exposed to the failure of one or more clearing members, then CLS Bank might at some point

become unable to complete crucial deliveries of large amounts of currencies. This could lead to a significant disruption of financial markets or international commerce. Arguably, this may suggest that CLS Bank should not provide clearing services in combination with its settlement services. On the other hand, the claim by some market participants that FX derivatives exposures are small, thus representing little benefit from clearing, is not well supported by my review of the publicly available data on FX volatilities, gross market values of positions, volumes of derivatives trading by maturity, and total outstanding notional amounts of FX derivatives.¹⁰

If clearing is indeed an important mitigant of systemic risk, then a failure to further regulate counterparty risk in the foreign exchange derivatives market could be a significant mistake. The component of counterparty risk that is not treated by settlement at CLS could be covered by a parallel system of contracts by which a separate margin-holding financial utility offers protection against losses in the net market value of FX derivative caused by counterparty defaults. This parallel financial utility would maintain a default guarantee fund and collect initial and variation margin based on the daily revaluation of the FX derivatives, in essentially the same manner as a normal central clearing counterparty. This would not provide a backstop for the gross deliveries of currencies through CLS Bank, but would insulate original counterparties (some of whom are systemically important) from potentially important losses in market value due to counterparty failure. In order to obtain both operating efficiencies as well as the benefit of netting gains against losses on other classes of derivatives, the financial utility could be encompassed within an existing CCP.

According to data provided by the financial industry organization known as the Foreign Exchange Committee, and available through the web site of the Federal Reserve Bank of New York,¹¹ more than 40 percent of the monthly volume of new FX forward contracts have maturities over one month. These longer-maturity forwards have a total notional monthly volume of \$1.4 trillion. Roughly 30 percent of the monthly volume of new FX swaps have maturities

¹⁰For details, see Duffie (2011). Here, I borrow some of the language from my 2011 submission.

¹¹See Foreign Exchange Committee (2011).

of over one month. These longer-maturity swaps have a total volume of about \$1.8 trillion.¹² Even larger than these new-trade volumes are the total outstanding notional amounts of these derivatives that exist at maturities over one month. Disclosure of the outstanding amounts by maturity is not provided by the Foreign Exchange Committee. In my opinion, the outstanding amounts, by maturity, should be publicly disclosed in order to facilitate an analysis of marketwide counterparty risk.

In its own survey, the Bank for International Settlements (BIS) reports a total outstanding notional amount of foreign exchange swaps and forwards (not including International Swaps and Derivatives Association-style currency swaps) of roughly \$31 trillion, as of June 2010.¹³ There are no publicly available data bearing on the effective average maturity of FX forwards and swaps, a critical gap in our knowledge of whether the risks from this class of derivatives are systemically important. Based on the BIS data as well as the monthly volume data provided by the Foreign Exchange Committee, the total outstanding notional amount of FX forwards and swaps with maturities over one month could be on the order of \$10 trillion.

The BIS survey indicates that the total gross market value of outstanding FX forwards and swaps was \$777 billion in June 2011. (The gross market value of a derivatives contract is the amount that would be lost in the event of default, before considering the effect of netting gains against losses on other derivatives, and before considering recoveries, for example, through the application of collateral.) The total gross value of FX forwards and swaps is more than that of equity derivatives (\$708 billion) or commodity derivatives (\$471 billion). Equity and commodity derivatives were not exempted from

¹²The 2010 versions of these amounts reported by the Foreign Exchange Committee do not appear to coincide with information provided in the comment letter of November 10, 2010 to the U.S. Treasury by the Global FX Division, an organization affiliated with the Securities Industry and Financial Markets Association, the Association for Financial Markets in Europe, and the Asia Securities Industry & Financial Markets Association, and signed by James Kemp. I am not yet aware of how to reconcile the differences.

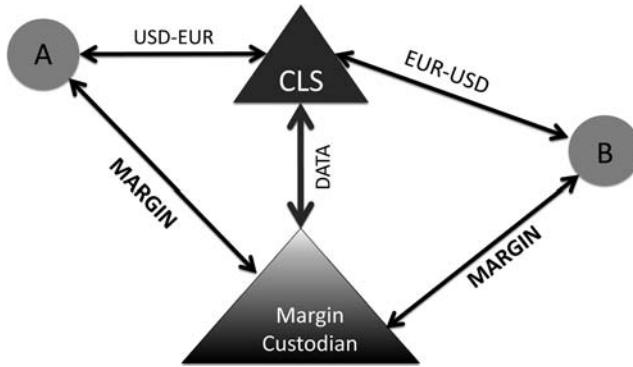
¹³The total outstanding notional amount of all types of foreign exchange derivatives, including currency swaps that are not proposed to be exempted from Dodd-Frank swap requirements, is indicated by the BIS survey to be approximately \$65 trillion.

the clearing and other requirements of the Dodd-Frank Act. Further, the total gross market value of FX forwards and swaps is about 60 percent of the total gross market value of credit default swaps (\$1.35 trillion). The market values of credit default swaps (CDS) may have lower volatility, on average, than those of FX derivatives. Absent the disclosure of data allowing a proper quantitative analysis, the total effective amount of counterparty risk in the FX derivatives market could be of a magnitude similar to that of the market for credit default swaps. The importance of clearing credit default swaps figured prominently in legislative discussions preceding the Dodd-Frank Act.

Taken together, the above data do not support the view that foreign exchange derivatives represent a small amount of counterparty risk. The volatilities of currency prices are significant and could increase dramatically in certain types of financial or currency crises, or dramatic currency realignments such as that following the Plaza Accord of September 1985. The tail risks of counterparty exposure on FX contracts can be quite large, particularly in situations with significant sovereign risk, which may plausibly arise in coming years. Volumes in FX markets have been growing rapidly. Within a decade, the Chinese currency, the renminbi, is likely to add significantly to the volume of FX markets and to total FX counterparty risk. The FX market also exhibits substantial concentration to specific currencies, particularly the U.S. dollar and the euro. According to the most recent data provided by the Foreign Exchange Committee, FX derivatives for the delivery of dollars against euros account for over 25 percent of the total volume of FX derivatives trading. By comparison, the market for credit default swaps has a far lower concentration of trade on a single underlying risk factor.

Figure 10 illustrates a potential approach that I have proposed for obtaining an economic effect similar to that of clearing for those FX derivatives that are settled at CLS Bank. As the dollar-euro contract increases in market value to bank A through fluctuations in currency prices, variation-margin payments are collected from bank B by a special-purpose financial utility. The financial utility could be operated by a traditional central clearing party or by CLS Bank. The margin payments are made in an agreed standard margin currency, such as U.S. dollars. If the market value of the position of bank A

Figure 10. Provision of Margin on Foreign Exchange Derivatives Contracts to a Financial Market Utility



subsequently declines, a corresponding amount of the margin that had been posted by bank B is returned to bank B.¹⁴

In order to lower operational costs, FX contracts with a sufficiently short maturity—for example, under one week—could be exempted from a clearing requirement. Likewise, exemptions could be provided for FX derivative contracts in relatively illiquid currency pairs, or for customized financial products with small notional amounts. Finally, one could exempt from clearing those market participants whose total notional derivatives positions are below some reasonable quantity threshold. One must be cautious, of course, to avoid regulations that unintentionally encourage the migration of trade to exempted products or participants. International standards

¹⁴Margin payments by bank A can be based on the total net market value of all FX contracts held by bank A. That is, losses may be offset by gains in determining the net margin amount. As this net value moves against bank A, margin is paid by bank A to the CCP. Because currency deliveries would be made at CLS Bank rather than at the CCP, it may be natural to design the margining contracts so that the CCP holds variation margins in a segregated account on behalf of in-the-money members. The CCP would send these margin deposits back to out-of-the-money members upon a notice of delivery of currencies at CLS Bank. CLS Bank would have access to margin account data held at the CCP in order to ensure that a currency delivery is not processed unless there is sufficient margin posted by each party to cover remaining open positions. Once an FX contract delivers through CLS, the margin held by the CCP against that contract is released to the margin provider.

established by the Committee on Payment and Settlement Systems and the Technical Committee of the International Organization of Securities Commissions (CPSS-IOSCO) (2004) for the central clearing of derivatives do not contemplate the elimination of delivery settlement risk at one financial utility (in this case, CLS Bank) and the indemnification of losses of net market value due to counterparty failure in a separate financial utility. The CPSS-IOSCO standards call for this combined effect of clearing to be obtained instead by a single financial utility that becomes the legal counterparty to the original buyer and seller. Thus if the U.S. Treasury wishes to adopt an alternative approach such as that proposed here, it may find it necessary to issue an exemption with respect to the manner in which the effect of clearing is to be obtained.

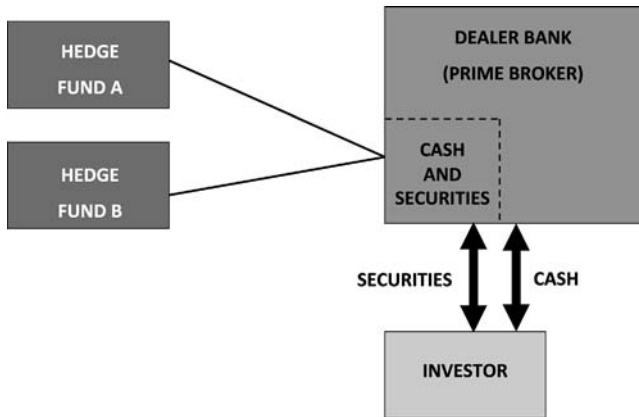
The proposed exemption of FX derivatives from the requirements of the Commodities Exchange Act as “swaps” would also exempt uncleared FX derivatives from minimum bilateral collateral requirements. To exempt both cleared and uncleared FX derivatives from minimum regulatory standards for collateralization or margin would, in my opinion, be a mistake.

5. Prime-Brokerage and Dealer Liquidity

Several large dealers are active as “prime brokers” to hedge funds and other large investors. A prime broker provides clients a range of services, including custody of securities, clearing, cash-management services, securities lending, financing, and reporting. A dealer also frequently serve as derivatives counterparty to its prime-brokerage clients. In the United States, Rule 15c3 of the Securities Exchange Act of 1934 protects brokerage clients from exposure to a broker-dealer failure. During the financial crisis of 2007–09, however, it appears that this rule did not prevent large broker-dealers from being destabilized by the departure of their prime-brokerage clients.

In the United Kingdom, securities and cash in prime-brokerage accounts are generally mingled with the prime broker’s own assets and thus available to the prime broker for its business purposes, including secured borrowing. As for regulatory requirements, cash in London-based prime-brokerage accounts can be held in a form

Figure 11. Assets Pledged to a Prime Broker and Repledged to the Third Party

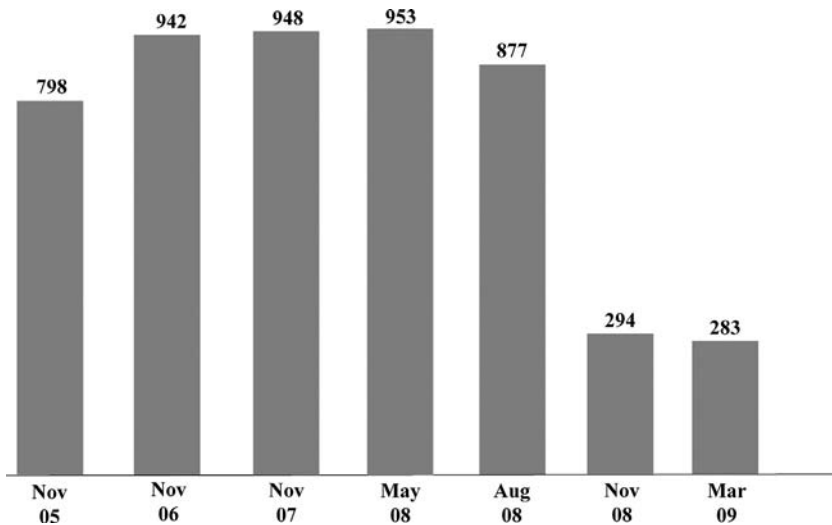


equivalent to uninsured demand deposits, a source of concern. Prime brokers operating under U.S. rules may or may not fully segregate their clients' cash, depending on the situation, according to Rule 15c3-2 of the Securities and Exchange Act of 1934 governing the treatment of free credit balances.¹⁵ These balances are the amounts of cash that a client has a right to demand on short notice. Under Rule 15c3-3, a U.S.-regulated prime broker must aggregate its clients' free credit balances in safe areas of the broker-dealer's business related to servicing its customers or otherwise deposit the funds in a reserve bank account to prevent commingling of customer and firm funds. If prime-brokerage clients pull cash from their free credit balances, then this cash is no longer available to meet the demands for cash of other clients on short notice, so the prime broker may choose to use its own cash to meet these demands.

Further, hedge funds may post securities with their prime brokers, with permission given to the prime brokers to repledge those securities to third parties so as to obtain cash financing for the prime broker itself. In this way, the prime broker can act as a conduit for secured lending to its prime-brokerage clients. Figure 11 illustrates

¹⁵See also U.S. Securities and Exchange Commission (2004).

Figure 12. Securities Pledged to Morgan Stanley That Were Available to be Repledged to Third Parties



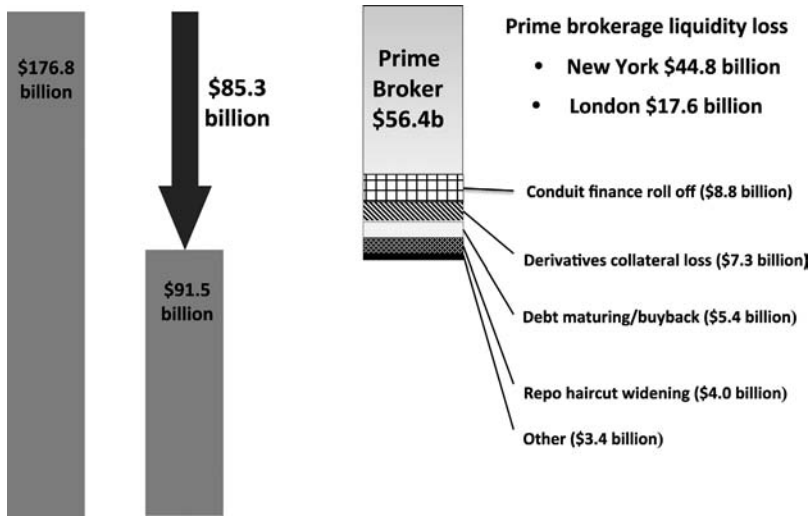
Data Source: Aitken and Singh (2009), from SEC filings.

Figure Source: Duffie (2010).

such a relationship. Rule 15c3 places strict limits on the reliance of client investors on prime brokers to obtain leverage in this manner, and thus puts a brake on the leverage that the prime broker itself can obtain through repledging. Nevertheless, any difference between the haircuts (overcollateralization) applied to prime-brokerage clients and the haircuts applied to prime brokers represents an effective source of additional cash financing to the prime broker.

Figure 12 shows data collected by Singh and Aitken (2009) on the amounts of securities pledged to Morgan Stanley, during the reporting periods surrounding the failure of Lehman, that Morgan Stanley was able to pledge to others. The sudden drop in repledgeable assets shortly after the failure of Lehman represents a substantial run of Morgan Stanley's prime-brokerage clients. A failure of Morgan Stanley would have left the hedge funds that had not run with a claim against their assets but no guarantee of quick or complete return of the assets.

Figure 13. Sources of Loss to Morgan Stanley's Liquidity Pool, September 10–22



Source: Disclosure by Morgan Stanley to the Federal Reserve Bank of New York.

Figure 13, based on data provided by Morgan Stanley to the Federal Reserve Bank of New York,¹⁶ illustrates sources of reductions in the liquidity pool of Morgan Stanley in the period of days surrounding the failure of Lehman Brothers. The dominant source of loss in liquidity was through an effective run by Morgan Stanley's prime-brokerage clients.

In response to the financial crisis of 2007–09, it has been anecdotally reported that many hedge funds have arranged for additional prime brokers. As illustrated in figure 14, this allows a hedge fund to quickly port its assets from a prime broker whose stability is of concern to a “safer” prime broker. Clearly, this represents a heightened run risk for a prime broker whose stability comes into question. An alternative and more stable approach is illustrated in figure 15. A three-way legal agreement, involving a hedge fund, its prime broker,

¹⁶These data were released through a request under the Freedom of Information Act.

Figure 14. Hedge Fund with Two Prime Brokers

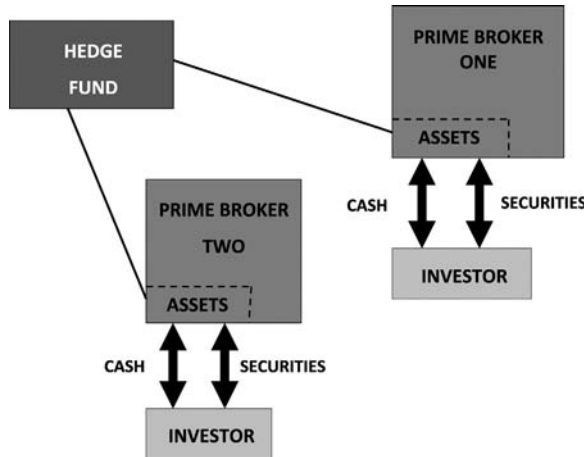
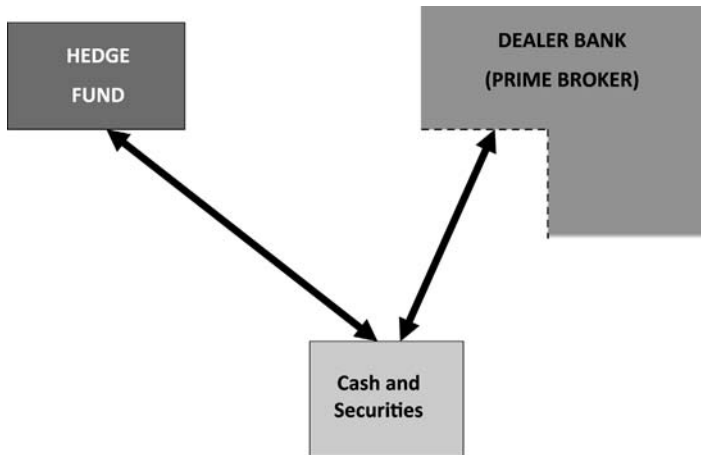


Figure 15. Three-Way Collateral Agreement Involving Hedge Fund, Prime Broker, and Custodian



and a custodian, allows the hedge fund's collateral to be placed in the custodian. The collateral is available to cover the losses of the hedge fund but can be returned safely to the hedge fund (provided its obligations to the prime broker have been met) in the event that the prime broker's performance becomes suspect. The three-way agreement reduces away-from-failure efficiency gains associated with the

ability of the prime broker to repledge the hedge fund's assets as collateral, as a source of financing.

6. Concluding Remarks

By examining the resiliency of the financial system as a network of interacting nodes and links, one may be in a better position to understand its stability in the face of financial shocks. I have focused here on the “plumbing,” meaning major institutional arrangements connecting participants in core financial markets that are fixed in the short run. Significant improvements in financial stability are ongoing, the most important of which are increases in the capital and liquidity requirements of regulated financial institutions, and new tests of their individual abilities to withstand stresses. Significant work remains to be done, however, in order to improve the ability of the “plumbing” to support financial stability in a manner that, in my opinion, adequately reflects costs and benefit.

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