

# SENIOR SUPERVISORS GROUP

## Risk Management Lessons from the Global Banking Crisis of 2008

*October 21, 2009*



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**SENIOR SUPERVISORS GROUP**

October 21, 2009

Mr. Mario Draghi, Chairman  
Financial Stability Board  
Bank for International Settlements  
Centralbahnplatz 2  
CH-4002 Basel  
Switzerland

Dear Mr. Draghi:

On behalf of the Senior Supervisors Group (SSG), I am writing to convey *Risk Management Lessons from the Global Banking Crisis of 2008*, a report that reviews in depth the funding and liquidity issues central to the recent crisis and explores critical areas of risk management practice warranting improvement across the financial services industry. This report is a companion and successor to our first report, *Observations on Risk Management Practices during the Recent Market Turbulence*, issued in March 2008.

The events of 2008 clearly exposed the vulnerabilities of financial firms whose business models depended too heavily on uninterrupted access to secured financing markets, often at excessively high leverage levels. This dependence reflected an unrealistic assessment of liquidity risks of concentrated positions and an inability to anticipate a dramatic reduction in the availability of secured funding to support these assets under stressed conditions. A major failure that contributed to the development of these business models was weakness in funds transfer pricing practices for assets that were illiquid or significantly concentrated when the firm took on the exposure. Some improvements have been made, but instituting further necessary improvements in liquidity risk management must remain a key priority for financial services firms.

In the attached report, we identify various other deficiencies in the governance, firm management, risk management, and internal control programs that contributed to, or were revealed by, the financial and banking crisis of 2008. Our report highlights a number of areas of weakness that require further work by the firms to address, including the following (in addition to the liquidity risk management issues described above):

- the failure of some boards of directors and senior managers to establish, measure, and adhere to a level of risk acceptable to the firm;
- compensation programs that conflicted with the control objectives of the firm;
- inadequate and often fragmented technological infrastructures that hindered effective risk identification and measurement; and
- institutional arrangements that conferred status and influence on risk takers at the expense of independent risk managers and control personnel.

In highlighting the areas where firms must make further progress, we seek to raise awareness of the continuing weaknesses in risk management practice across the industry and to evaluate critically firms' efforts to address these weaknesses. Moreover, the observations in this report support the ongoing efforts of supervisory agencies to define policies that enhance financial institution resilience and promote global financial stability.

*Transmittal letter*

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This analysis builds upon the first SSG report, which identified a number of risk management practices that enabled some global financial services organizations to withstand market stresses better than others through the end of 2007. The extraordinary market developments that transpired following the release of the first report prompted the SSG to launch two new initiatives. First, the group conducted interviews with thirteen firms at the end of 2008 to review specific funding and liquidity risk management challenges faced, and lessons learned, during the year. Second, in our supervisory capacities, we asked twenty global financial institutions in our respective jurisdictions to assess during the first quarter of 2009 their risk management practices against a compilation of recommendations and observations drawn from several industry and supervisory studies published in 2008. During the spring of 2009, SSG members reviewed the assessments and held follow-up interviews with fifteen of these firms to explore areas of continued weakness, as well as changes to practice undertaken recently. This report presents the SSG's primary findings from these initiatives.

In their self-assessments, firms generally indicated that they had either fully or partially complied with most of the recommendations. SSG members, however, found that the assessments were, in aggregate, too positive and that firms still had substantial work to do before they could achieve complete alignment with the recommendations and observations of the studies. In particular, supervisors believe that a full and ongoing commitment to risk control by management, as well as the dedication of considerable resources toward developing the necessary information technology infrastructure, will be required to ensure that the gaps between actual and recommended practice are closed in a manner that is robust and, especially important, sustainable.

As with the first report, we are simultaneously releasing our findings to relay the conclusions of our initiatives to the broader industry and to call attention to critical areas of risk management in which further effort is warranted.

Sincerely,



William L. Rutledge  
*Chairman*

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## I. INTRODUCTION

On March 6, 2008, the Senior Supervisors Group (SSG) released its first report, *Observations on Risk Management Practices during the Recent Market Turbulence* (the “first report”). The report conveyed our assessment of the risk management practices that made some firms better able than others to withstand market stresses in the fall of 2007. At that time, firms faced the collapse of the leveraged loan market, a near total loss of liquidity in the asset-backed commercial paper market, and a sharp loss in the value of subprime mortgages and of certain structured products such as collateralized debt obligations and securities backed by subprime mortgages. These and other significant difficulties undermined the confidence of investors and counterparties, challenged the resilience of highly interconnected global financial institutions, and destabilized the global financial system, setting the stage for a deep financial crisis.

Following the release of our first report, the decline in housing prices became even more pronounced, triggering a far greater loss of value in mortgage-related exposures and other financial assets and ultimately leading to a weakening of the global economy. Financial losses and public concern grew to the point that investors doubted the accuracy of firms’ balance sheets and ultimately their creditworthiness. Around the globe, large financial firms failed, were forced to negotiate their sale to others, or restructured themselves. In other cases, public authorities undertook extraordinary and controversial measures to alleviate the stress, not just on financial organizations, but more broadly on their national economies.

In response to the continuing crisis, the SSG—a forum composed of senior supervisors of major financial services

firms from Canada, France, Germany, Japan, Switzerland, the United Kingdom, and the United States—undertook to evaluate for a second time how weaknesses in firms’ risk management and internal controls may have contributed to the industry’s severe distress. In this report, we review key developments since the first report, share our risk management observations (primarily on funding and liquidity risk issues) for 2008, and discuss the industry’s own sense of its compliance with recommendations put forward in various supervisory and industry studies in 2008.<sup>1</sup>

To capture the industry view, members of the SSG met with senior managers at thirteen of the largest financial institutions in late 2008 to review the funding and liquidity risk challenges they faced that year and the lessons they learned from these challenges.

In late 2008, the SSG members, in our supervisory capacity, asked twenty major global financial firms in our respective jurisdictions to assess their risk management processes to identify any gaps with previously issued industry or supervisory recommendations. The surveyed financial institutions completed these self-assessments during the first quarter of 2009 and presented the results to both their boards of directors and their primary supervisors. The primary supervisors then evaluated the quality of the assessments and held discussions with the firms on their remediation efforts. In light of the continuing stress in the financial markets, SSG members held a second round of interviews with fifteen institutions during the first half of 2009 to explore the broader lessons learned from recent events.

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<sup>1</sup> Studies referenced in the exercise include Senior Supervisors Group, *Observations on Risk Management Practices during the Recent Market Turbulence* (March 2008); Financial Stability Forum, *Report of the Financial Stability Forum on Enhancing Market and Institutional Resilience* (April 2008); Institute of International Finance, *Final Report of the IIF Committee on Market Best Practices: Principles of Conduct and Best Practice Recommendations* (July 2008); and Credit Risk Management Policy Group III, *Containing Systemic Risk: The Road to Reform* (August 2008). In addition, U.S. firms were asked to consider recommendations and observations in President’s Working Group on Financial Markets, *Policy Statement on Financial Market Developments* (March 2008).

## II. SUMMARY OF KEY OBSERVATIONS AND CONCLUSIONS

**Many of the weaknesses highlighted in our first report continued to contribute to financial strains.** Despite the passage of many months since we published our first survey in March 2008, we found that a large number of firms had not fully addressed the issues raised at that time. The fact that they had not done so is due in part to the considerable investment and expertise needed to effect necessary changes across globally active, complex financial institutions, and in part to the increased funding and liquidity risk management challenges that arose over 2008 and into 2009. The four firm-wide risk management practices that we had identified in our first report as differentiating better performance from worse were:

- effective firm-wide risk identification and analysis,
- consistent application of independent and rigorous valuation practices across the firm,
- effective management of funding liquidity, capital, and the balance sheet, and
- informative and responsive risk measurement and management reporting.

Implementing these practices comprehensively across large, complex organizations requires considerable resources and expertise, and it was evident that many firms still fell short in these areas.

In addition, events following the release of our first report in the spring of 2008 exposed further weaknesses at the largest financial institutions in corporate governance and control procedures, as well as in liquidity and capital management processes. In particular, the failure of liquidity risk management practices has been at the heart of the evolving crisis in this period. Funding and liquidity risk management practices may, moreover, be among the most difficult to adjust under pressure, because they are often closely tied to each firm's central strategies.

### *Funding and Market Liquidity Problems*

**The events of 2007-09 demonstrated on a large scale the vulnerabilities of firms whose business models depended heavily on uninterrupted access to secured financing markets.** Many firms relied on excessive short-term wholesale financing of long-term illiquid assets, in many cases on a cross-border basis—a practice that made it difficult for the firms to

withstand market stresses absent deposits and sovereign and central bank support. Borrowers had taken advantage of the opportunity the market afforded to obtain short-term (often overnight) financing for assets that should more appropriately have been funded with long-term, stable funding. Faced with uncertainty about the value of specific instruments and mindful of the higher volatility of assets more generally, lenders demanded substantial cushions, or “haircuts,” on the assets they were willing to finance.

**Firms that were least affected by market developments had the a priori discipline to resist excessive short-term funding.** Some larger and more diverse financial institutions were able to weather events initially by drawing on other sources of funding, such as deposits, liquidity pools consisting of sovereign bonds and, when available, central bank lending facilities.

**Some firms' business models also relied on excessive leverage, which, combined with doubts about the realizable value of the firm's assets, heightened solvency and business-model concerns among the firms' creditors and counterparties.** Firms permitted excessive leverage and reliance on short-term financing to develop over time because of a combination of risk governance weaknesses and misaligned incentives (as explained below), incomplete risk capture in management reports, limitations or unintended consequences of regulatory requirements, and ineffective market discipline. These structural issues affected a wide range of financial institutions, including various U.S. investment banks, certain U.S. and U.K. mortgage banks, some German Landesbanks, and some banks that had recently completed acquisitions that strained their capital base with the assets and risks acquired. However, market stresses affected nearly all major global financial institutions, with most requiring some form of assistance. In this environment, exceptional official sector support was necessary to maintain the viability of the financial system.

**The disruption of the secured financing market highlighted a number of issues relating to the U.S. triparty market for repurchase agreements (repos).** Securities dealers often depended on the triparty repo market to fund certain kinds of securities—increasingly, as time passed, illiquid and hard-to-price securities—and were consequently vulnerable to disruptions in that market.

Lenders funded through triparty arrangements significant volumes of illiquid securities that they would be prohibited from retaining should a borrower fail. Clearing agent banks took on significant credit risk by extending intraday credit without fully considering whether they would be able to liquidate collateral should the need arise. Borrowers failed to anticipate the collateral amounts that their clearing agents would require when faced with providing intraday funding for a weak borrower with a deteriorating collateral pool.

**Similarly, the bankruptcy of Lehman Brothers International (Europe)—LBIE—highlighted the risks of relying on the rehypothecation of clients' securities as a source of funding.** Many counterparties of LBIE elected to have accounts that allowed Lehman to rehypothecate securities positions to obtain funding. After LBIE declared bankruptcy, prime brokerage clients sought to withdraw from these arrangements. However, these clients were deemed unsecured creditors of the estate and found themselves without access to their positions. The failure of Lehman Brothers generated concern among hedge fund customers relating to the fact that, in certain instances, their prime brokerage free credit balances and other assets in the United Kingdom were not subject to segregation; in many cases, customers decided to withdraw from these arrangements. Firms whose U.K. dealer subsidiaries relied on rehypothecating clients' securities to obtain funding did not recognize that this source of funding would be lost when Lehman Brothers declared bankruptcy.

**Firms also failed to realize that two important sources of funding, securities lending and money market funds, could impose further demands on firm liquidity during periods of stress.** Traditional sources of funding, especially for European banks, such as securities lending reinvestment pools and money market mutual funds, faced significant and immediate pressures to reduce their investment positions. These pressures became apparent following the announcement of losses in the Primary Fund series of the Reserve Fund in the United States.

#### *Firms' Reevaluation of Existing Practices*

The global financial firms participating in the liquidity and self-assessment exercises have begun reevaluating existing practices at the corporate and business line level.

**Many firms acknowledged that, if robust funds transfer pricing practices had been in place earlier, they would not have carried on their trading books the significant levels of illiquid assets that ultimately led to large losses and would not have built up significant contingency liquidity risks**

**associated with off-balance-sheet exposures.** Firms have reported that substantial efforts are under way to implement or enhance funds transfer pricing practices, including both broadening the scope of business activities subject to transfer pricing and integrating transfer pricing more deeply with firm processes.

**In addition, many firms are reevaluating how they measure their future needs for funding. Before the crisis, most firms relied heavily on a "months of [contractual] coverage" metric that did not adequately reflect the contractual and behavioral demands triggered in a stressful market environment.** For example, the coverage metric did not capture many of the stresses that developed during the crisis, such as meeting demands for collateral from clearing agents and counterparties, accepting credit default swap (CDS) novations, and—even when not contractually required to do so—supporting instruments and vehicles such as sponsored funds, structured investment vehicles, and money market and similar funds. Recognizing the weakness of their existing measures of funding needs, firms are now enhancing their calculations of "stress needs."

**A key lesson of the crisis, drawn by both firms and supervisors, was that complex corporate structures hindered effective contingency funding.** Firms found that complex corporate structures, often created to arbitrage tax and regulatory capital frameworks, also imposed significant constraints on the flow of funds across the firm between legal entities. As a result, firms are acknowledging the importance of a bottom-up approach to contingency planning, which includes the preparation of contingency funding plans at the individual legal entity level. This is an area of considerable supervisory interest going forward.

#### *Supervisory Evaluation of Firm Self-Assessments and the Identification of Critical Areas for Continued Improvement*

Amid rising losses in 2008, numerous public and private sector groups published studies after the first SSG report that articulated practices or principles thought to be critical to the resilience of internationally active financial institutions. Prompted by general agreement on the benefits of many of these practices and principles, the SSG members invited twenty firms to evaluate their practices against the findings of these studies.

**Most of the participating firms offered favorable self-assessments, albeit to varying degrees across the set of recommendations. While the SSG generally agrees with the relative ranking of compliance with specific**

**recommendations, we believe that *absolute* rankings were too positive and that substantial work is still needed to achieve full alignment with the existing recommendations and observations.** Two factors in particular drive the gaps between current practices and those advocated by industry groups and supervisors. First, many firms' information technology (IT) infrastructure is inadequate to monitor risk exposures accurately, a problem long in the making that will also take time to remedy. Second, firms need to reexamine the priority they have traditionally given to revenue-generating businesses over reporting and control functions.

**Section IV below details ten critical areas for improvement that emerged from the self-assessment results and interviews and that are broadly relevant across firms.**

Supervisors believe that considerable work remains in the areas of governance, incentives, internal controls, and infrastructure. The absence of action in some critical areas, such as the proper alignment of incentives and improvements to firms' IT infrastructure, should raise questions for boards of directors, senior managers, and supervisors about the effectiveness and sustainability of recent changes. Closing some of the acknowledged gaps, particularly those associated with infrastructure, will be resource- and time-intensive. Continued oversight on the part of supervisors and sustained discipline and commitment on the part of firms will both be required if the necessary investments and adjustments to practice are to be successfully made.

**An overarching observation that relates to many of the areas singled out for improvement is that weaknesses in governance, incentives, and infrastructure undermined the effectiveness of risk controls and contributed to last year's systemic vulnerability.** In the interviews we conducted for this report, we found that many firms—regardless of whether they required government support—and their supervisors had concluded that the incentives and controls in place throughout the industry had failed. These failures reflected four challenges in governance:

- the unwillingness or inability of boards of directors and senior managers to articulate, measure, and adhere to a level of risk acceptable to the firm,
- arrangements that favored risk takers at the expense of independent risk managers and control personnel,
- compensation plans that conflicted with the control objectives of the firm, and

- an inadequate and often fragmented infrastructure that hindered effective risk identification and measurement.

**A key weakness in governance stemmed from what several senior managers admitted was a disparity between the risks that their firms took and those that their boards of directors perceived the firms to be taking.** In addition, supervisors saw insufficient evidence of active board involvement in setting the risk appetite for firms in a way that recognizes the implications of that risk taking. Specifically, only rarely did supervisors see firms share with their boards and senior management a) robust measures of risk exposures (and related limits), b) the level of capital that the firm would need to maintain after sustaining a loss of the magnitude of the risk measure, and c) the actions that management could take to restore capital after sustaining such a loss. Supervisors believe that active board involvement in determining the risk tolerance of the firm is critical to ensuring that discipline is sustained in the face of future market pressures for excessive risk taking.

**Within firms, the stature and influence of revenue producers clearly exceeded those of risk management and control functions.** Belatedly responding to this imbalance, virtually all firms have strengthened the authority of the risk management function and increased the resources devoted to it. Nevertheless, firms face considerable challenges in developing the needed infrastructure and management information systems (MIS).

**Some of the imbalance we noted between risk and rewards can be seen in the approaches to remuneration.** There is broad recognition that industry compensation practices were driven by the need to attract and retain talent and were often not integrated with the firms' control environments. Among the critical weaknesses that the firms cited are the following:

- Historical compensation arrangements evidenced both insensitivity to risk and skewed incentives to maximize revenues.
- The accrual of compensation pools historically did not reflect all appropriate costs.
- Schemes for measuring individual performance often failed to take into account true economic profits, adjusted for all costs and uncertainty.

Firms are considering changes to their compensation regimes—including modifications to the accrual of bonus pools, the allocation of pools to business units and individuals,



and the form of compensation paid out—with the goal of better aligning practices with the control objectives of the firm. Among the changes that have been, or are being, put in place or considered are:

- tying bonus accrual and performance measurement more directly to economic profit by incorporating the costs of risk, liquidity, and capital;
- integrating the input of control functions with performance evaluations; and
- reviewing deferred compensation plans with an eye toward longer vesting and distribution periods.

**Overall, the crisis highlighted the inadequacy of many firms' IT infrastructures in supporting the broad management of financial risks.** In some cases, the obstacle to improving risk management systems has been the poor integration of data that has resulted from firms' multiple mergers and acquisitions. This problem has been seen as affecting firms' ability to implement effective transfer pricing, consistently value complex products throughout an organization, estimate counterparty credit risk (CCR) levels, aggregate credit exposures quickly, and perform forward-looking stress tests. Building more robust infrastructure systems requires a significant commitment of financial and human resources on the part of firms, but is viewed as critical to the long-term sustainability of improvements in risk management.

**While firms reported enhancements to, and increased use of, stress testing to convey risk to senior management and the board of directors, supervisors noted that significant gaps remained in firms' ability to conduct firm-wide tests.** Firms cited significant management support for enhancements to stress-testing practices—a reversal of past experiences. Nevertheless, most firms still do not have the ability to perform regular and robust firm-wide stress tests easily, although significant efforts are under way to address this issue.

**Finally, although this report focuses mainly on individual firms' efforts to improve their practices—and our assessment of the limitations of those efforts—we note that the industry's substantial efforts to standardize practices and reduce backlogs of unconfirmed over-the-counter (OTC) derivatives positions appear to have significantly mitigated a substantial systemic risk.** Firms reported progress in streamlining business processes to achieve same-day matching, in adopting and implementing standard technology platforms, and in improving collateral management practices and reducing notional amounts of CDS outstanding through portfolio compression. Despite this significant effort to mitigate risk, further improvements are needed in key personnel's knowledge of financial market utilities and communication with settlement infrastructure providers.

### III. FUNDING AND LIQUIDITY RISK MANAGEMENT

Funding and liquidity problems were central to the financial crisis in the fall of 2008. In this section, we first provide background on the funding challenges experienced by many financial firms during the crisis, and then discuss observed and planned changes in funding and liquidity risk management practices.

#### A. Background on Major Funding Stresses

The unusual—and, in some cases, unprecedented—strains in a range of funding markets were a defining characteristic of the crisis from March 2008 onward and are therefore a primary focus of this report. SSG member agencies and the firms participating in the SSG exercises were largely in agreement concerning the nature of the funding stresses, notwithstanding their differing vantage points and the varying relevance of the observations in this section to individual firms and jurisdictions. We do not provide an exhaustive or definitive record of all funding challenges faced by firms during this period. Rather we focus on the issues and developments characterized as most fundamental by many of the firms and those that stood out most prominently to SSG member agencies in our supervisory capacities during the crisis.

##### 1. General Firm and Market Stresses

The events of 2007-09 underscored the vulnerabilities of those firms whose business models were highly dependent on uninterrupted access to secured funding markets.

Beginning in the summer of 2007 and continuing through 2009, lenders' willingness to finance less traditional, harder to price collateral diminished. In addition, counterparties and creditors sought to lessen their exposure to firms perceived to be "weaker" by reducing the amount of credit provided, increasing haircuts on positions financed, and shortening the term for which credit was extended. Moreover, secured lenders tightened their definitions of acceptable collateral. These trends posed particular difficulties for firms that, lacking adequate liquidity reserves or contingent sources of funding, relied heavily on short-term repo funding collateralized by illiquid assets.

The near-collapse of Bear Stearns in March 2008 illustrated several important dimensions of the funding crisis:

- the drain on firms' liquidity created by their reliance on the short-term secured funding markets to finance long-term illiquid assets;
- the vulnerability of firms to the loss of secured funding when they have no access to central bank liquidity;
- the critical role of the triparty repo clearing agent; and
- the number of ways in which client and investor apprehensions about a firm's prospects are expressed—not only through falling stock prices and the widening of credit default swap spreads, but also through the withdrawal of prime brokerage free credit balances and the increased novations of trades away from the firm.

Concerns among Bear Stearns' prime brokerage clients, triggered by rumors about the firm's viability, led to outflows of free credit balances over a short period. Most critically, Bear Stearns faced a sudden and dramatic loss of repo counterparty confidence, such that the firm's secured funding base essentially disappeared. While repo financing has always been susceptible to rollover risks, Bear Stearns' over-reliance on overnight repos to fund less liquid assets proved to be particularly problematic. Ultimately, fueled by the firm's declining stock price and widening credit spreads, lenders' unwillingness to provide funding to Bear Stearns even on a secured basis led to its forced sale.

The dynamics of the subsequent Lehman Brothers failure were similar to the Bear Stearns dynamics just described. However, because Lehman Brothers actually entered bankruptcy, the firm's failure had far greater consequences for financial markets:

- Custody of assets and rehypothecation practices were dominant drivers of contagion, transmitting liquidity risks to other firms. In the United Kingdom, there was no provision of central bank liquidity to the main broker-dealer entity, Lehman Brothers International (Europe), and no agreement was struck to transfer client business to a third-party purchaser. As a result, LBIE filed for bankruptcy while holding significant custody assets that would not be returned to clients for a long time, and therefore could not be traded or easily hedged by clients. In addition, the failure of LBIE exposed the significant risks run by hedge funds in allowing their prime broker to exercise rehypothecation rights over their securities.<sup>2</sup> Under U.K. law, clients

<sup>2</sup> London-based Lehman Brothers International (Europe) filed administration proceedings on September 15, 2008. On the same day, Lehman Brothers Holdings Inc. filed for Chapter 11 bankruptcy in the United States. On September 17, 2008, Barclays announced an agreement to purchase Lehman Brothers Inc., the U.S. broker-dealer subsidiary.

stand as general creditor for the return of such assets. The loss of rehypothecated assets and the “freezing” of custody assets created alarm in the hedge fund community and led to an outflow of positions from similar accounts at other firms. Some firms’ use of liquidity from rehypothecated assets to finance proprietary positions also exacerbated funding stresses.

- Money funds liquidated investments in financial institutions perceived to be vulnerable. The Primary Fund series of the Reserve Fund “broke the buck” following Lehman Brothers’ bankruptcy because of its holdings of Lehman commercial paper. When this event was combined with rising concern that certain money market mutual funds (MMMFs) might be holding paper of distressed financial firms, institutional investors began a run, prompting many money funds to liquidate their investments to honor such redemption requests.
- Securities lending cash reinvestment funds also reduced funding to vulnerable financial institutions. As traditional purchasers of financial institutions’ debt, cash reinvestment pools’ demand for these investments declined, particularly when market forces caused the values/prices of such debt to decline and become less liquid. Also, reinvestment pools’ need for cash increased dramatically as borrowers deleveraged, the value of the stocks on loan declined, and beneficial owners withdrew cash collateral from pools experiencing illiquidity and losses.
- Interbank lending, particularly in Europe, collapsed as investors became extremely concerned about institutional creditworthiness following the failure of Lehman Brothers and losses on Washington Mutual holding company and bank debt.<sup>3</sup>

Underpinning many of the dynamics observed in the Bear Stearns and Lehman cases were weaknesses in secured funding markets that became starkly apparent at the peak of the crisis.

#### *a. Secured Funding/Triparty Repo Transactions*

- **Risks arose from the increased use of short-term triparty repos to fund longer term illiquid assets and from clearing banks’ provision of intraday credit.**

A substantial reliance by financial institutions on secured funding markets to finance either lesser quality or less easily

priced instruments on a short-term basis contributed to a false sense of comfort with firms’ liquidity positions.

The triparty repo market grew to be an important source of funding for broker-dealers and other financial entities that did not have access to stable deposit pools or lower cost, unsecured lines of credit. The legal structure of the product varied between the U.S. and European models. In the United States, clearing banks (the third party in triparty repo agreements) act as agents and facilitate the daily unwinding of securities and cash by providing intraday credit. This intraday funding is secured by the same securities used the previous night in the triparty repo transactions. Each morning, the clearing banks have the right to decline to provide intraday funding. They might do so if they have credit concerns about a particular borrower or are uncertain of their own ability to liquidate collateral without loss in times of volatile market conditions. If the clearing bank chooses not to unwind the transaction, then lenders have the right to liquidate the collateral and the borrower will not regain its inventory of securities. In the European triparty repo model, by contrast, there is no daily unwinding of the transaction. Instead, borrowers can make substitutions into and out of the collateral pool that they have posted with the third-party agent provided that they continue to comply with the margin requirements, limits set on asset quality, concentration limits, and so forth.

Market events in September-October 2008 highlighted potential difficulties in the U.S. unwinding mechanism and in both U.S. and European protocols for dealing with troubled borrowers. From the borrower’s perspective, the daily unwinding of triparty repo transactions and the very short maturities of the loans mean that lenders can withdraw from a particular borrower in a matter of days and often overnight. Significantly, most money market mutual funds (which make up the bulk of lenders in this market) may not be permitted to invest directly in the securities that serve as collateral in their repo transactions, so that the investors might be required to dispose of such collateral as soon as possible upon default of the counterparty. However, while liquidity levels fluctuate over time, a good percentage of securities financed through triparty repos are, in fact, illiquid. As such, the forced sales by these lenders could cause losses and put downward pressures on market prices.

To the clearing banks that must provide intraday funding each morning, the risks and costs of liquidating a large pool of collateral are elevated when markets are volatile. As a borrower deteriorates, it is often selling and using its most liquid collateral elsewhere, and the pool of collateral financed in triparty repo transactions becomes increasingly riskier and less liquid. Further, the failure of a major bank is likely to cause

<sup>3</sup> J.P. Morgan Chase did not purchase the assets or assume the liabilities of the holding company, nor assume the unsecured senior debt, subordinated debt, or preferred debt of the bank—with the result that Washington Mutual’s bondholders received minimal, if any, recovery value while creditors were moved to reevaluate the risk of holding company and unsecured debt. These outcomes further heightened investors’ concerns about the riskiness of bank and holding company debt.

the securities held as collateral to fall rapidly in value. While clearing banks have the right to charge their own haircuts for intraday funding, high liquidity premiums are generally not applied. Thus, clearing banks also have an incentive to move first, and either notify borrowers that they cannot rely on intraday funding or keep triparty repo transactions locked so that lenders retain the securities (and the liquidation risks). In practice, when faced with the risk of a weak borrower and a large pool of illiquid assets, the clearing bank will often first seek to obtain additional liquid collateral to reduce its credit exposure. Such a step represents a further incremental demand on the borrower's liquidity resources.

Triparty repo transactions bring together three very different types of participants with different abilities to address the risks associated with these transactions. Moreover, the disorderly liquidation of a large pool of collateral, concurrent with the failure of a large borrower, poses systemic risks for the financial markets. For these reasons, a collaborative effort to address the risks that arise with collateral liquidation may be the best way to apply the lessons learned. The issues and incentives around triparty repo transactions are complex; firms noted several areas in which lenders, borrowers, and clearing banks could modify their practice:

- Lenders were funding considerable amounts of harder to price collateral, much of it with extended tenors that they would not be able or willing to invest in directly. Firms questioned whether lenders have set the correct investment parameters, such as margins, concentration limits, limits on illiquid collateral, and limits on the overall size of the collateral pool, to prevent a borrower default and the subsequent "fire sale" liquidation of the collateral from causing material harm to the lender. Firms also questioned whether some lenders have the operational ability to undertake liquidation.
- Several firms noted that many borrowers had relied too heavily on short-term triparty repo, particularly to fund longer term illiquid assets, without substitute sources of liquidity, and that this was not prudent. Several borrowers had no effective limits on the amount of illiquid securities that could be funded through triparty repos, and failed to restrict their overall dependence on this one market. One firm suggested applying a framework that would identify alternative sources of funding to allow firms to function if triparty transactions were not renewed with investors at maturity.
- Clearing banks for the U.S. triparty repo market are pursuing enhancements to their risk controls to prevent repo transactions from posing undue risks to firms and

the financial markets. While not principal to the original transactions, clearing banks should ensure that the provision of intraday liquidity collateralized by triparty repo securities is executed within an appropriate risk management framework. Firms suggested that this framework should address concentrations of securities, potential exposure to securities that are of lower credit quality or are illiquid, and haircut policies. In addition, firms suggested that credit risk managers independent of the business area should monitor borrower creditworthiness and behavior, transaction and collateral trends, and the resulting credit exposures in relation to the capital of the clearing bank. Finally, firms are reviewing their risk management reporting, escalation policies, and collateral liquidation procedures and processes.

### *b. Deposit Trends*

- **Vulnerable firms faced sustained outflows; firms perceived to be strong gained new deposits.**

Banks perceived by market participants to be more vulnerable experienced sharp outflows during the crisis, particularly in commercial and wealth management deposits. One bank saw its deposits decline more than 13 percent during the weeks following Lehman Brothers' bankruptcy; another bank lost more than 50 percent of its deposits over a six-month period. The subsequent market stress had divergent effects on financial firms that were considered strong or too-big-to-fail and others that were perceived as susceptible to the stress. Uninsured deposits, in particular, moved to banks perceived to be more financially resilient. Banks that benefited from the flight to quality experienced significant increases in retail and commercial deposits, drawing in institutional money, in particular, that was moving from higher risk institutions and from uncertain markets. Banks that benefited from deposit inflows primarily placed funds at central banks, assuming that these sudden increases in deposits were "transitory." Many of these banks, apprehensive about the creditworthiness of counterparties, were reluctant to lend out their increased balances to firms with significant funding needs.

For relatively stronger firms, assumptions about depositor behavior did not change significantly, although firms were now more focused on maintaining relationships with clients. Competition for deposits increased substantially, according to several firms. Pricing and promotions expanded, but firm managers reported that signaling also became a concern. For example, the management of one firm believed that it had experienced large inflows of retail and wholesale deposits precisely because the rates offered were low relative to the rates

paid by peers—a signal to the market that the firm was not in distress. Depositors became aware that some of the best rates offered during the eighteen-month crisis came from firms that soon went out of existence.

***c. Interbank Deposits, Unsecured Funding, and the Foreign Exchange Swap Market***

- **Counterparty concerns led to the near-cessation of interbank funding.**
- **The funding available was increasingly concentrated in short-term tenors.**

The interbank deposit market, a particularly important market for European financial institutions, had only a few large net providers of funds before the liquidity crisis, according to firm reports, and became an altogether unreliable source of funding during the crisis. In essence, during the turmoil that followed the Lehman Brothers bankruptcy, few firms were willing to increase their credit exposure to other market participants. Most, if not all, firms sought to conserve their liquidity and reduce exposures to other institutions that they perceived as vulnerable. Central banks began directing liquidity into the market and became the counterparty and funds provider of choice for many market participants. Other institutions, including smaller financial firms and those thought to be vulnerable to the market crisis, were effectively shut out of the interbank funding market because of firms' heightened risk awareness.

Traditionally a significant source of funds, the term issuance of debt obligations (obligations with maturities greater than one year) was only available in limited amounts to some firms during the twelve months ending in mid-September 2008 and stopped abruptly with the bankruptcy of Lehman Brothers. Subsequently, funding became increasingly concentrated in short-term tenors, specifically six months or less. In light of the particular challenges experienced in September-October 2008, managers at several firms were pleased that they had had the discipline to build term funding up to a year earlier, even though it had seemed as if they were paying an excessive rate for the funds at the time.

The dollar-yen and dollar-euro swap markets dried up after Lehman's collapse, posing a particular risk for certain European and Japanese firms that had chosen to finance illiquid U.S. dollar assets with short-term funding. This development proved to be especially problematic for some European firms that had developed large concentrations of U.S. dollar-denominated assets before the crisis but did not have direct access to dollar deposits through U.S. branches or subsidiaries. As a result, beginning in September 2008, firms

experienced severe difficulties swapping euros or yen for U.S. dollars. This mismatch, which lasted for a relatively long period, necessitated an expansion of bilateral foreign exchange swap facilities at central banks—an arrangement that allowed firms to cope with their deteriorating access to U.S. dollar funding by drawing on the facilities.

**2. Prime Brokerage<sup>4</sup>**

- **Firms underestimated the funding vulnerabilities created by prime brokerage.**
- **The case of Lehman Brothers International (Europe) highlights the contagion risk that rehypothecation in insolvency proceedings poses for both firms and investors.**
- **The near-failure of Bear Stearns highlights the “frictional” liquidity issues that arose as clients withdrew balances, creating a temporary need for funding.**
- **Asymmetrical unwinding of client positions was a material drain on liquidity.**

Before the crisis, many broker-dealers considered the prime brokerage business to be either a source of liquidity or a liquidity-neutral business. As a result, the magnitude and unprecedented severity of events in September-October 2008 were largely unanticipated.

***Lehman Brothers International (Europe):  
The Contagion Risk of Rehypothecation  
in Insolvency Proceedings***

When LBIE went into administration on September 15, 2008, all client assets it held in prime brokerage accounts, whether in custody or rehypothecated, were frozen. In the United Kingdom, hedge funds could elect to establish segregated accounts at their prime broker, but in most cases they entered into prime brokerage agreements that enabled LBIE to rehypothecate clients' securities to obtain funding. By granting rehypothecation rights over their assets to the prime broker, clients typically obtained cheaper margin loan pricing. Those assets that had been rehypothecated were not, by definition, segregated; thus, hedge fund clients became general creditors on the estate with respect to those assets. When assets were held in segregated custody arrangements,

<sup>4</sup> Prime brokerage, a service offered by securities firms to hedge funds and other professional investors, may include centralized custody, the execution and clearance of transactions, margin financing, securities lending, and other administrative services such as risk reporting. The growth of the hedge fund sector over the last decade was supported by a concurrent growth in the prime brokerage businesses within the investment banks that serviced these funds.

they would not be released to clients quickly, and these assets could not be traded or easily hedged in the interim. The scale of these issues compelled hedge funds to take account of the level of credit and operational risk that they were exposed to through their prime brokerage relationships.

Because of these concerns, immediately following LBIE's default, a number of hedge funds and other prime brokerage clients withdrew their portfolios from remaining prime brokers with similar arrangements if these firms were perceived to be vulnerable. These prime brokers experienced an extraordinary outflow of funds, causing significant liquidity and operational stresses.

### *Free Credit Balances: Frictional Liquidity Issues in the United States and the Demand for Segregation in the United Kingdom*

In March 2008, the clients of Bear Stearns' prime brokerage service became increasingly concerned about the ability of the firm to meet its obligations; the clients sought to move their accounts to competitors perceived to be of higher credit quality and, in the process, to withdraw substantial amounts of free credit balances.<sup>5</sup> This development happened quickly at Bear Stearns, with client free credit balances declining drastically in the course of one week.

At that time, when a client of a U.S. broker-dealer withdrew balances from its account, known as free credit balances, the broker-dealer had to borrow to finance the remaining customer debits. Moreover, the amount of customer free credit balances withdrawn was still subject to segregation, or "lockup," under rule 15c3-3 of the Securities and Exchange Commission (SEC) until the lockup requirement was recalculated. The calculation generally took place weekly before the crisis, but was undertaken more frequently, even daily, during the crisis. Thus, prime brokerage arms of firms subject to large customer withdrawals satisfied clients' free credit balance withdrawals from the investment banks' own liquidity until the next 15c3-3 lockup calculation was performed. The overnight delay in the release of locked-up funds resulted in an additional temporary, or frictional, loss of liquidity for the period that funds withdrawn were still subject to segregation. Following the failure of LBIE, prime brokers received an enormous number of requests from

<sup>5</sup> Hedge funds typically leave free credit balances, or balances in excess of margin requirements, on account at the prime broker. This is done to signal the creditworthiness of the fund to the prime broker, to earn returns directly or indirectly provided by the prime broker on these funds, and to ensure adequate funds to address frictions in the movement of balances. A hedge fund's decision to leave free credit balances on account at a prime broker will also depend on its perception of the creditworthiness of the prime broker. In turn, prime brokers may make use of this cash, albeit subject to different regulatory considerations in the United States and United Kingdom.

hedge fund clients for the repayment of free cash balances and excess margin. When free cash was not withdrawn totally, numerous requests were received for amounts either to be transferred to the U.S. broker-dealer where balances could be subject to the 15c3-3 lockup protections or to be placed in segregated accounts in the United Kingdom. In both cases, the U.K. prime broker suffered a loss of cash that could otherwise have been used for financing its balance sheet.

### *Absolute Loss of Liquidity Associated with the Asymmetrical Unwinding of Client Positions*

The asymmetrical unwinding of client positions was a particular challenge, exacerbated by the short selling bans imposed globally by regulators on financial stocks. Some prime brokers had adopted a cross-client portfolio-based funding model that financed one client's long position by matching it with a second client's short position.<sup>6</sup> As one client's short position was closed out, the other client's long position had to be refinanced by the prime broker in a highly stressed market for secured funding transactions.

### **3. Unwinding of Securities Lending Transactions**

- **A number of U.S. cash collateral reinvestment funds experienced reduced liquidity and/or fair market value losses as the issuers of certain assets in which the funds had invested defaulted, as other assets experienced decreasing market values, and as the market for such assets froze up. Such reinvestment funds experienced additional pressures as some borrowers redeemed cash collateral and some lenders curtailed lending or withdrew (or attempted to withdraw) cash collateral.**
- **Reinvestment funds were forced to pull back from triparty reinvestments in broker-dealers and other firms. Even though some reinvestment funds increased the percentage of their holdings invested in triparty repo transactions, the overall effect was a reduction in the size of investment pools and decreased funding to triparty repo borrowers on an absolute basis.**

The severity of the risks associated with securities lending activities—as with prime brokerage—caught many participants by surprise. Before the crisis, many market participants considered securities lending to be low-risk and liquidity-positive, because cash was typically reinvested in

<sup>6</sup> If the client short position and the rehypothecated long position involved different securities, the prime broker might contract with a third party to essentially swap one stock for the other, or otherwise use one client's asset as collateral for a third-party stock loan that would cover the other client's short position.

short-term, highly liquid money market instruments that were typically over-collateralized. As a result, some beneficial owners and firms managing reinvestment funds may have become complacent about the liquidity, credit, market, and operational risks inherent in securities lending and failed to anticipate the severity of the liquidity risks in a highly stressed market environment.

Until the recent crisis, the securities lending market had grown dramatically over the past thirty years, owing in part to the increase in the number of hedge funds and others engaged in short selling (a practice that relies on borrowed securities), as well as other needs for securities borrowing. Custodial banks and other global financial firms sought to capitalize on this trend, offering global securities lending services to pension funds, endowments, insurance companies, and other institutional investors with large inventories of securities.

### *Heightened Awareness of Reinvestment Risks during the Crisis*

In the United States, where securities lending transactions have typically been collateralized by cash,<sup>7</sup> risk associated with the reinvestment of the cash collateral has always existed. For example, if the loan requires the payment of a borrower rebate, there is always a risk that the borrower's rebate rate could exceed the reinvestment interest rate. There is also the risk that the instruments in which the cash collateral is invested could become illiquid or incur losses. The beneficial owner, not the borrower, is typically responsible for any losses incurred in the cash collateral investments.

During the crisis, this risk became a reality as a number of cash collateral reinvestment vehicles experienced illiquidity and losses. The causes for this are varied and remain under study. In some cases, the cash collateral was invested in debt instruments, including asset-backed commercial paper (ABCP), Lehman and other broker commercial paper, and structured investment vehicles (SIVs). In some cases, the term to maturity of these instruments was longer than that of, for example, instruments found in registered money market funds. During the crisis, some of these instruments defaulted, and many experienced a decline in price, value, and liquidity.

A number of these instruments may have been highly rated and liquid when acquired, but became less highly rated and increasingly illiquid as market events unfolded. The longer their remaining maturity, the more vulnerable the instruments were. Once the instruments became illiquid or incurred losses, some beneficial owners and their cash collateral managers had

to decide whether to sell the instruments in an illiquid market (if that was possible) and realize significant losses, or to retain the instruments in the hope of riding out the crisis.

### *Impact of Securities Lending Turmoil on the Size of Reinvestment Pools and the Volume of Funding Available to Repo Borrowers*

Major credit disruptions such as the bankruptcy of Lehman Brothers and the large financial losses of AIG, along with the turmoil in closely linked markets, triggered an unwinding of securities lending transactions and strained many beneficial owners' and agent lenders' securities lending businesses, in some cases significantly. Securities lenders retreated across the major markets, reducing exposures by recalling securities on loan, severely curtailing new loans, and reducing the tenors of new transactions.

The need to borrow securities also declined as hedge funds and other market participants moved to deleverage and to preserve cash in the face of falling stock prices, regulatory bans on short selling, and rising redemptions of hedge fund shares. The values of securities and other types of noncash collateral fell, and certain trades such as long/short equity, convertible arbitrage, and equity upgrades came to a halt, largely because of dramatically reduced demand for less transparent securities. As a result of this dynamic and the sharp decline in the value of equity markets, some firms' securities lending pools and outstanding transactions dropped substantially in September-October 2008 in both the U.S. and European markets. The unwinding of transactions caused significant liquidity pressures and operational challenges.

The liquidity stress was greatest in the United States, owing to its larger emphasis on cash collateralized transactions, and greatest where the lending program's focus was on "volume/securities finance" lending rather than "intrinsic value" lending.<sup>8</sup> Agent lenders faced a huge demand to return securities to the beneficial owners and cash collateral to

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<sup>8</sup>The "volume/securities finance" approach to securities lending in the United States seeks to lend out as many securities as possible, including securities that are not in high demand. When securities not in high demand are lent out, the lender typically must pay the borrower a rebate, which is usually based on the federal funds rate. If the loan requires the payment of a rebate to the borrower, then the cash collateral reinvestment rate must exceed the borrower rebate rate. The "intrinsic value" approach focuses on lending securities that are in high demand, for which the borrower rebate will be smaller or zero. In some cases, the lent security will be in such great demand that the borrower will pay the lender a rebate. When the borrower rebate is small or nonexistent, the beneficial owner does not need to be as concerned that the return on cash reinvestment will exceed a borrower rebate or be a separate profit center, and the cash collateral can be reinvested in very short-term government instruments with the goal of protecting principal.

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<sup>7</sup> Contrast this with Canada and the United Kingdom, where noncash collateral has been the norm in securities lending transactions.

borrowers, along with a high number of margin calls. The funds thus experienced shortages of cash associated with the overall maturity mismatch of investments, falling asset values and the inability to sell assets into a stressed market, demands for cash associated with the return of securities from deleveraging hedge funds, and margin calls, attributable to declines in equity prices, from borrowers of equity securities. The extreme liquidity demands on the funds and their general inability to sell assets into a frozen market—as well as potential reputational risk—prompted at least two agent lender firms to support their reinvestment funds through cash infusions, purchases of assets, and capital support agreements.

In Europe and elsewhere, the greater prevalence of noncash collateral facilitated a more rapid unwinding of loans because of the absence of cash reinvestment risks. In addition, equity collateral in particular afforded a degree of price transparency not observed in certain fixed-income collateral.

Operationally, the pullback by the beneficial owners contributed substantially to the spike in “fails” (the failure of trades to settle) in September 2008. The number of beneficial owners (including many foreign central banks) calling their securities back for fear of dealing with any broker-dealers reduced the supply of Treasury securities available to make settlement. In response, regulators introduced an economic incentive to reduce fails of U.S. Treasury securities with the recently implemented Treasury Market Practices Group fails charge. While the measure may lower the risk of fails, it does not address some of the broader risks associated with securities lending.

Securities lending cash reinvestment funds (along with money market mutual fund investors) are significant lenders in triparty repos.<sup>9</sup> Even as some reinvestment funds increased the percentage of their holdings invested in triparty repos, the reduction in the size of securities lending programs and their investment pools substantially reduced the funding provided to triparty repo borrowers on an absolute basis, particularly for less easily valued forms of collateral.<sup>10</sup>

<sup>9</sup> As noted earlier, the distinguishing feature of a triparty repo transaction is that a custodian bank or international clearing organization acts as an intermediary between the lender and the borrower. The triparty agent is responsible for the administration of the transaction, including collateral allocation, marking to market, and substitution of collateral. Both the lender and borrower of cash enter into these transactions to avoid the administrative burden of bilateral repo transactions.

<sup>10</sup> In the aftermath of the crisis, commensurate declines in the repo and securities lending markets meant that reinvested cash collateral from securities lending transactions has continued to be approximately 25 percent of the approximately \$2 trillion triparty market globally.

#### 4. 2a-7 Money Market Mutual Funds and Non-2a-7 Funds

- **MMMFs significantly reduced, or even halted, their purchases of commercial paper and other short-term investments as concerns about firms’ viability escalated.**
- **For banks with sponsored funds, the decline in the value of the funds’ investments and the funds’ inability to liquidate certain investments prompted bank sponsors to provide support to stabilize net asset values and meet redemptions.**

##### *Withdrawal of Money Market Mutual Funds from the Market*

MMMFs are one of the largest buyers of bank short-term liabilities and are a key provider of liquidity to global financial firms. These funds have come under pressure several times since the summer of 2007 because of losses related to SIVs and concerns about the assets backing ABCP programs. For this reason, firms’ access to the MMMF investor base was already reduced in periods prior to the events of September–October 2008.

In mid-September, expected losses on Lehman paper led to a run on the Primary Fund series of the Reserve Fund in the wake of the Lehman bankruptcy.<sup>11</sup> News of this run prompted institutional investors to seek additional redemptions in other funds. For example, in the United States, SEC-registered nongovernment (including prime) funds targeted to institutional investors experienced a 30 percent decline in net assets over the four weeks ending October 8, 2008, as investors sought to move cash to government money funds.<sup>12</sup> According to firms interviewed, money market mutual funds quickly retreated from purchasing financial firm issuances of commercial paper, ABCP, repo investments, and certificates of deposit following the Primary Fund’s collapse. MMMFs not only reduced purchases of these securities, but also refused to roll the securities they already held and significantly shortened tenors of any lending agreements with financial institutions. Firms indicated that most of the MMMF sector would not invest in

<sup>11</sup> The fund’s breaking of the buck was due to the decline in the value of its Lehman holdings. The resulting drop in net asset value to \$0.97 exacerbated redemption activity, which totaled more than \$40 billion (approximately 67 percent of the fund’s net assets) in the days surrounding these events. The Fund subsequently made five partial pro rata distributions amounting to approximately 92 percent of the Fund’s assets as of the close of business on September 15, 2008. Approximately \$3.5 billion remained in the Fund as of October 2009.

<sup>12</sup> See <[http://www.ici.org/pdf/mm\\_data\\_2009.pdf](http://www.ici.org/pdf/mm_data_2009.pdf)>.



unsecured commercial paper of financial institutions and would provide funds only rarely, on an overnight basis and at extremely high cost. Several financial firms remarked on the speed with which short-term funding secured by private label assets and other less easily valued assets dried up. MMMFs also requested that firms “bid back” existing investments to augment the funds’ cash reserves and to prepare them for further redemptions. Several of the firms interviewed reported that bid-back requests were particularly high during the week of September 15, 2008, following the Lehman default.

Contributing to this dynamic were the MMMFs’ concerns about both the underlying assets that they were financing and the creditworthiness of the counterparties to the transaction. On the other side of most repo transactions are longer dated assets that generally cannot be held by certain money market funds because of tenor restrictions. In the event of a counterparty default, these assets would then have to be sold into a poorly performing secondary market.

### *Sponsors’ Actions in Support of Their Funds*

In addition to facing reduced funding from the MMMF sector, a significant number of financial firms supervised by SSG agencies provided some form of support to sponsored funds to prevent a possible “breaking of the buck” scenario. The support provided by these financial institutions to date has mainly taken the form of asset purchases, capital support agreements, and direct investments in the fund. A small number of firms have provided support in the multibillion dollar range to affiliated funds, but the majority of firms have provided more limited sums.

## **B. Funding and Liquidity Risk Management Observations**

In this section, we describe the risk management lessons and changes conveyed to supervisors in meetings with management of firms. We begin by addressing broadly applicable changes that many firms were considering, including significant attention to funds transfer pricing. We then discuss the changes being made in response to specific issues involving secured financing, prime brokerage, and securities lending.

### **1. Risk Management Changes Broadly Applicable to General Firm and Market Stresses**

- **Firms are seeking to ensure that they have global control of liquidity by strengthening the role of corporate treasury, enhancing the infrastructure to support funding-related MIS and stress testing, and attempting to tighten limits and build stronger liquidity buffers.**
- **Particular emphasis is being placed on improving the funds transfer pricing process.**
- **The complexity of firm structure complicates contingency funding plans.**

Almost all of the firms surveyed have sought to strengthen structures and processes to enhance the governance of liquidity. Firms were taking steps to improve the structure of their treasury, liquidity risk management, and related functions. In addition, they were seeking to enhance liquidity reporting and other forms of communication about liquidity between these areas and the business lines as well as to senior management and the boards of directors. Funds transfer pricing processes and many aspects of contingency planning were also being enhanced. An important question for firms and supervisors is the extent to which such changes are formalized into policies and procedures and prove to be effective in the management of funding and liquidity risks over time.

### *Treasury/Liquidity Risk Management Structure*

Firms observed that the organization and interaction of treasury, risk management, and the businesses lines undermined in some cases the effectiveness of liquidity management during the peak of the crisis in September–October 2008. Firms reported that they were undertaking changes that reflect this awareness.

- Some firms—particularly those that attributed a less comprehensive identification of risk to the fact that risk management was not part of the treasury function—were considering moving liquidity risk oversight responsibilities to the chief risk officer (CRO) or embedding an autonomous liquidity risk management unit in treasury.
- Firms were moving to more centralized treasury models to address funding and liquidity issues. Other changes noted by certain firms were the integration of the secured financing function with treasury and the

separation of cash management activities from the business line.

- Some firms looked to improve coordination between such areas as treasury, prime brokerage units, secured funding desks, and unsecured funding desks; coordination between the last two functions is especially important because of the risk of losing secured funding and the need to replace the financing of assets with unsecured funding.
- Communication channels between risk control functions were also established or strengthened. Some firms stated that the treasury function's relationship with credit was critical for the effective evaluation of liquidity risk and monitoring of counterparty status. For example, in one case, margin loans had been approved only by the credit department; now they are jointly approved by both the credit and funding functions.

### *Liquidity Management Information Systems*

Many firms acknowledged shortcomings in their MIS infrastructure and in their ability to produce useful reports during the crisis, recognizing that better-quality and more timely liquidity reporting was essential to effective management of liquidity and funding issues during a crisis. In light of this, a number of firms said they were increasing their spending on infrastructure, improving their data, and strengthening the quality and timeliness of their reporting.

Liquidity reports did not capture fully the risks in several key areas, in particular:

- secured borrowing and lending, including information on maturity mismatches and asset liquidity;
- derivatives businesses, including collateral outflows resulting from rating changes and asset price movements; and
- off-balance-sheet funding vehicles and certain non-contractual obligations, providing greater transparency into contingency funding risks.

During the crisis, liquidity reports were produced increasingly on a daily and intraday basis to enable firms to better assess the funding flows of major asset and liability categories, in turn highlighting areas more vulnerable to funding draws or withdrawals. Most firms felt that the speed of information became critical to managing through the peak period of the crisis.

Firms said they undertook improvements to liquidity gap management reports as well as to key ratios and stress-testing

metrics in standard liquidity MIS. By late 2008, liquidity reports were becoming more comprehensive, according to interviewees. These reports better captured information on discount window collateral, deposit pricing, deposit flows, daily positions and the outlook, cash surplus and consumption of cash, unsecured funding, long-term debt issuance, and changes in balance sheet, capital, and leverage ratios.

### *Liquidity Stress Testing*

Market conditions and the deteriorating financial state of firms exposed weaknesses in firms' approaches to liquidity stress testing, particularly with respect to secured borrowing and contingent funding needs. These deteriorating conditions underscored the need for greater consideration of the overlap between systemic and firm-specific events and longer time horizons, and the connection between stress tests and business-as-usual liquidity management.

Firms sought to enhance scenarios used to stress liquidity positions, particularly with the overlay of systemic scenarios. As a result, firms have recognized the need to move beyond traditional stress tests involving deteriorating credit quality, rating downgrades, and/or historically based scenarios and to look increasingly at hypothetical situations that are more systemic in nature and longer in duration. Some firms said they were aiming to apply several scenarios to each stress test and/or to include both short- and long-term horizons. Firms have also focused on improved reporting of stress-test results and increased coordination between business lines. More specific examples of change include the following:

- Some firms reported a wide range of new scenarios and stress tests, including the loss of secured funding of certain asset classes, a collapse in foreign exchange swaps, operational crisis, counterparty failure, mutual fund redemptions, and ABCP illiquidity.
- Stress-testing time horizons varied significantly. For example, one firm applied a one-month horizon for a firm-specific scenario and a two-week horizon for a market scenario. Another firm applied time horizons from three to six months, to one year—the latter reflecting the reality for many firms of prolonged stressed conditions during the crisis.
- Firms cited the importance of reviewing and retesting assumptions associated with stress tests. Market stresses during the crisis yielded additional information on the behavior of various on- and off-balance-sheet items during an event. For example, firms revised their assumptions about the availability of term funding and/or securitizations during a crisis,

as well as the ability to continue to obtain secured funding of certain asset classes, the extent to which haircuts can vary across different forms of collateral, and the ability to monetize less liquid collateral. However, some firms observed that other assumptions might have been too extreme. For instance, the assumptions of no liquidity in the residential mortgage market or of significant draws on loan commitments seemed to overstate the risks in those exposures during this crisis. Nonetheless, most firms' own data reflected a "survivor's bias"; that is, because the firms did not fail, there were no data on behavior under severe firm-specific duress.

- Firms reported the need to analyze deposits more thoroughly to better understand which deposits were more likely to leave. A more granular analysis was needed to evaluate the differing vulnerabilities of insured versus uninsured, international versus domestic, and corporate versus retail deposits, as well as those of high-net-worth customers. One firm modeled a full depositor run, noting that the main constraints to outflow were operational, such as website crashes or cash machine depletions.
- Most firms believed that they were now effectively identifying legally binding contingencies. Following the initial awareness of significant ABCP issues starting in August 2007, firms have anticipated better ABCP conduit onboarding. In terms of loan commitments, firms have studied draws closely, but they generally did not see them as a primary issue during the crisis as of late 2008. Firms did not attribute corporate draw-downs to the obligor's concern about the banking firm's own liquidity. Instead, interviewed firms generally believed that corporate draw-downs were driven more by adverse changes in macroeconomic conditions. More broadly, firms were considering how to overlay behavioral assumptions on contractual requirements. For instance, firms were reviewing their assumptions about loan renewals, as the crisis had highlighted the importance of considering potential signaling effects about the availability of funds for such renewals.
- Many firms reported a need to identify and prepare more effectively for noncontractual contingencies. Several of these "reputational" contingencies were still not accounted for in some firms' planning scenarios. These contingencies included the provision of support to money market funds, tender option bonds, and auction rate securities as well as the need to support secondary markets in assets as a market maker or in secondary bids for paper. Most contingency funding

plans did not include all relevant scenarios of this kind, suggesting that work remains for firms to identify potential noncontractual contingencies.

### *Liquidity Cushions and Limit Structures*

Interviewed firms typically calculated and maintained a measurable funding cushion, such as "months of coverage," which is conceptually similar to rating agencies' twelve-month liquidity alternatives analyses. Some institutions were required to maintain a liquidity cushion that could withstand the loss of *unsecured* funding for one year. Many institutions found that this metric did not capture important elements of stress that the organizations faced, such as the loss of secured funding and demands for collateral to support clearing and settlement activity and to mitigate the risks of accepting novations. Some firms said they were looking to complement their traditional "time-to-funding" measures with stress-coverage measures.

The liquidity crisis underscored for many firms the importance of holding sizable unencumbered liquidity pools, diversifying funding sources, and maintaining limit structures and approval requirements that are appropriate for a firm's risk appetite and liquidity risk profile. Most firms said they tightened or strengthened funding-related limits and approvals and developed a greater appreciation for the importance of diversifying funding sources and maturities. Firms generally set or tightened limits on wholesale funding and on the type of wholesale funding collateral, tenor, and domicile. In some instances, firms significantly reduced limits, and senior management had to approve all material funding transactions during peak periods of the crisis. At some firms, material new credit extensions now require treasury function approval.

The crisis emphasized for firms the need to strengthen collateral management and securities financing practices given the degree to which counterparty acceptance of less liquid collateral types can decline and haircuts and other terms can tighten in times of stress. Ultimately, following the failure of Lehman Brothers, many major firms required access to central bank liquidity facilities.

### *Funds Transfer Pricing*

Managers acknowledged that if robust funds transfer pricing practices had been in place earlier, and if the systems had charged not just for funding but for liquidity risks, their firms would not have carried the significant levels of illiquid assets on their trading books and the significant risks that were held off balance sheet that ultimately led to sizable losses. Most firms reported that funds transfer pricing mechanisms have

become more robust, with refined charges for the provision of liquidity, including contingent liquidity, and/or better alignment of incentives in business lines with established risk appetite.

Firms said they were increasing the scope of business activities covered in funds transfer pricing—including off-balance-sheet exposures—and applying funds transfer pricing more comprehensively across business lines and down to trading desk levels and beyond, where appropriate. Liquidity premiums have been added to certain activities to encourage stable funding. In addition, penalties have been assigned to discourage dependence on the parent or on short-term unsecured funds. Firms said they were working to integrate funds transfer pricing practices more fully into the overall liquidity risk management structure to ensure that established costs and incentives are having the desired effect and to avoid producing unintended arbitrage opportunities. Two firms were considering ways to charge businesses for stressed funding risk, as measured by their maximum cash outflow metrics.

Some treasurers transfer priced funds based on the expected holding period of the positions—irrespective of the position term or maturity. In many cases, the stated holding period was short term (trading) and the asset liquidity was unquestioned. As value and liquidity dissipated, the effective funding mismatch grew.

Firms found that increasing the cost of funds did not always work to control the balance sheet, as many trading desks and businesses had developed their own funding sources. For example, one firm found that upon receiving a higher cost of funds from corporate treasury, the prime brokerage unit would in turn offer clients a lower but attractive yield on deposits. In this case, prime brokerage would become a source of funding that would resell these funds to treasury—reducing the funds required from other sources. The prime brokerage funds, however, were extremely credit sensitive and departed from the firm at the first sign of distress. Some treasurers have introduced a bid/offer mechanism in transfer pricing in order to account for the likelihood that business units will source their own liquidity and arbitrage treasury.

### *Contingency Funding Plans*

Most firms' contingency funding plans were, to some degree, inadequate for the events of the second half of 2008. Firms generally agreed on the need to enhance their plans, which had become overly focused on institution-specific events often typified by credit rating downgrades by the rating agencies.

A key lesson of the crisis, observed by firms and supervisors, was that complex corporate structures hindered effective contingency funding. Firms found that these

structures, which were often created to arbitrage tax and regulatory capital frameworks, also created significant constraints on the flow of funds across the firm between legal entities. Treasurers had often devised contingent funding plans on a consolidated basis and failed to recognize the constraints on funds flow created by legal complexity. In some cases, the complexity of the organizational structure prevented firms from readily accessing secondary sources of liquidity, such as central bank discount facilities. As a result, firms acknowledged the importance of a “bottom-up” approach to contingency planning, which includes the preparation of contingency funding plans at the individual legal entity level.

## **2. Risk Management Changes Associated with Prime Brokerage**

- **Internal limits are being established on the use of rehypothecated client collateral and free credit balances.**
- **Firms are strengthening controls over client balance transfers.**
- **Dealers and clients are discussing the segregation of initial margins.**

### *Limits on Rehypothecation of Client Securities*

Growing out of the LBIE experience, documentation and contractual rights were subsequently renegotiated with hedge fund clients. In particular, limits were imposed on rehypothecation rights and caps were agreed to in international prime broker agreements where previously none had existed. Such rehypothecation caps were typically set at levels to cover margin debits and collateral haircuts and to allow for operational friction. There was also a push by prime brokers to ensure that client service and operational expectations were aligned with contractual provisions contained in governing agreements. Some hedge funds arranged to transfer unencumbered securities that exceeded rehypothecation caps out of prime broker accounts and into custodian or triparty accounts. In response, some firms said they have developed their own bankruptcy remote or custody solutions to address client demands for asset protection. In other cases, firms have established tight internal limits on their own reliance on rehypothecated client collateral.

### *Enhanced Controls over Requests for Balance Transfers and Financing Commitments*

During the period of crisis that followed Lehman's failure, the senior management of some firms said they became actively engaged in centrally monitoring and controlling firm-wide liquidity and the status of funding on a real-time basis. This

became especially important for firms with significant prime brokerage operations, where previously cash management had been conducted locally within the business unit. Because of the client service orientation of prime brokerage operations, client requests for immediate or real-time balance transfers were often met without consideration for the frictional impact on the liquidity profile of the business.

In addition to implementing new controls on outflows of funds, senior management imposed additional restrictions on accepting new transactions with funding implications. These restrictions placed a low or even zero limit on the amount of client financing that the sales force could commit to without explicit senior management approval.

### *Reduced Reliance on Free Credit Balances*

Following the experiences associated with Bear Stearns—and with growing market awareness of the magnitude of free credit balance outflows experienced by Bear Stearns prior to its acquisition—prime brokers have taken steps to adjust their assumptions on stress outflows, including their assumptions of the impact of severe market events on the level of free credit balances. By fall 2008, firms were able to accommodate these outflows more effectively.

Returns provided to prime brokerage clients on free credit balances were repriced by international prime brokers when their value as a relatively inexpensive source of funding diminished. This reassessment of value has largely been driven by internal controls and new risk-based funds transfer pricing arrangements established by centralized corporate treasury functions. The repricing has reduced the level of returns that hedge funds achieve on free credit balances.

Before the crisis, firms recognized that free credit balances could be drawn down quickly. However, some firms were unprepared for the scale and immediacy of the outflows of client portfolios and cash balances following the Lehman Brothers default. Consequently, internal reporting and transfer pricing had to be adapted to take account of this new liquidity risk profile. The latter change was necessary in order to reduce reliance on this relatively unstable, noncore source of funding.

Most prime brokers are making adjustments to transfer pricing and management reporting arrangements. The adjustments are intended to ensure that tight controls are placed on the financing side of the business and that liquidity risk pertaining to the prime brokerage business is within limits so that such risk does not impair the firm's overall liquidity risk profile.

### *Segregation of Margin*

A number of prime brokerage clients requested that independent amounts (initial margin) under the International Swaps and Derivatives Association's Credit Support Annex be held in segregated accounts. The purpose was to mitigate client exposure to a dealer's failure. Although some requests were met, overall the banks resisted these moves. Of note, there was a pricing implication associated with locking up initial margin, as these amounts are generally used for liquidity purposes, such as posting margin by the banks to clearing houses to cover exchange margining requirements. Many investment banks said the number of these requests declined as credit concerns eased. Still, as a result of the observed prime brokerage stresses in 2008, prime brokers started to provide hedge funds with more frequent (sometimes daily) and comprehensive management information presenting details and usage of all rehypothecated assets.

### **3. Risk Management Changes Associated with Securities Lending**

- **Beneficial owners tightened reinvestment guidelines applied by agents and are becoming more discriminating in their choice of counterparties.**
- **Firms are strengthening controls over commingled accounts; additionally, there has been some migration of clients from commingled to separate accounts.**

Firms have responded to the new environment following September and October 2008 by undertaking formal and informal changes to risk management and control practices. Firms have focused most on improving collateral and CCR management and on strengthening liquidity in their reinvestment funds. In addition, according to some, there has been a significant shift to “intrinsic value” lending by beneficial owners that previously may have taken a “volume/securities finance” approach.<sup>13</sup>

### *Higher Standards for Acceptable Collateral*

Beneficial owners and their agent lenders were establishing more conservative guidelines for their reinvestment programs. Outside of the United States, participants reported a move away from non-central-bank-eligible forms of collateral, such as equities and convertibles, and other asset classes generally perceived to hold greater credit and liquidity risk. Securities

<sup>13</sup>For an explanation of the intrinsic value and volume/securities finance approaches to securities lending, see footnote 8.

lacking transparency—for example, collateralized debt obligations and private-label mortgage-backed securities—were among the least desirable forms of collateral since September 2008.

Agents have engaged in more rigorous collateral reviews—for example, CUSIP-by-CUSIP assessments in some cases (despite the prohibitive expense that some see)—and in the establishment of a formal funding review of collateral in addition to a credit review.

### *Higher Liquidity Targets*

Prior to the onset of financial stress, some cash reinvestment fund managers sought higher yields in a low-interest-rate environment by investing in somewhat riskier assets that were still considered safe. Many of these securities proved to be illiquid during the crisis. As a result, agent lenders sought to increase the overall liquidity in their cash reinvestment funds as conditions deteriorated.

Overnight liquidity ratios in cash reinvestment funds varied as of December 2008, but in some cases they ranged between 20 and 30 percent, compared with approximately 10 percent prior to the financial crisis. As of December 2008, improvements in such ratios were attributed to maturing assets, new reinvestment business, and, in certain cases, sponsor support, and less to successful asset sales. Going forward, some firms are targeting higher overnight liquidity ratios, in the range of 30 to 50 percent of the fund's asset value.

### *Greater Counterparty Focus*

Beneficial owners and agent lenders were much more focused on counterparty risk and daylight exposures than they were before the crisis. Some agent lenders noted the importance of diversifying counterparties for the purposes of their own transactions.

Agent lenders said their existing credit concentration limits have generally not been faulted for significant losses in reinvestment funds. However, dramatic reductions in the size of firms' reinvestment books resulted in larger counterparty exposures exceeding issuer concentration limits in the aftermath of the crisis. As a result, fund managers were unable to purchase additional investments involving exposure to these counterparties.

### *Controls over Commingled Accounts*

Agent lenders reported strengthened controls over commingled reinvestment funds because of risks that surfaced in 2008. Commingled funds tended to have higher targeted liquidity levels, for example, approximately 50 percent of total net assets at one firm with significant commingled accounts.

Some managers of cash collateral reinvestment funds also imposed controls to restrict or slow cash redemptions by permitting beneficial owners to redeem in cash only for ordinary course redemptions (that is, to pay back borrowers), and required beneficial owners to maintain then-current levels of lending or the beneficial owners would be completely redeemed out in-kind.

One practice among cash collateral reinvestment funds that sustained losses was to lock down the losses in a manner that ensured a fair distribution of losses across the full investor base while allowing shareholders to redeem a "vertical slice" of fund investments.<sup>14</sup> In some instances, concerns about the effectiveness of these controls, including the timing or fairness of their application, have been the focus of lawsuits against agent lenders and have underscored the importance to firms of reviewing controls to protect themselves against legal and reputational risks.

## **4. Risk Management Changes Associated with Money Market Mutual Funds**

- **Sponsored funds are revisiting the adequacy of their liquidity buffers to protect against extreme tail events; while such events were not typical before the crisis, several firms were incorporating into their contingency funding plans support for MMMFs and/or conducting some form of stress testing by the September-October 2008 period.**

Several sponsoring firms said they revised their assumptions about the reliability of funding from MMMFs in an extreme scenario. Several firms said they focused on the level of liquidity in their funds, and several sources improved their contingency planning. The MMMF crisis underscored the need for greater consideration of leading practices in investment management appropriate for funds with a stable net asset value (NAV).<sup>15</sup> Events during the crisis also reinforced the importance of transparency to investors on the composition of portfolio holdings, particularly if firms are promising shareholders a stable NAV.

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<sup>14</sup> A vertical slice is the pro-rata portion of the fund's holdings received by an investor.

<sup>15</sup> Under paragraph (c)(7)(ii) of SEC Rule 2a-7, the firm's board must adopt (and periodically review) written procedures requiring the fund to calculate the extent of any deviation between the fund's NAV, determined by reference to the amortized cost, and the market value of the portfolio "at such intervals as the board of directors determines appropriate and reasonable in light of current market conditions." If the deviation exceeds 50 basis points, the board "shall promptly consider what action, if any" it should take. (Under Rule 2a-7(c)(1), a money market fund is able to rely on the amortized cost method of valuation only as long as the board believes it fairly reflects the market-based NAV.) The 50 basis point threshold is a trigger for when the board must get involved; it does not require the board to take any particular action.

### *Adequacy of Liquidity Buffers*

One large sponsor noted that liquidity in its MMMFs tended to be approximately 10 percent of total net assets prior to the crisis and was subsequently raised to 25 to 35 percent. This move appeared consistent with the broader trend among funds to improve their liquidity profiles.

### *Contingency Planning*

A few firms did incorporate fund support into their contingency funding plans (CFPs) before the crisis. Others had little or no reference to fund support in their CFPs prior to the September-October 2008 period. Regardless of prior approach, sponsoring firms did not anticipate the franchise and reputational risks associated with the run on MMMFs, and were generally unprepared for the extent of

liquidity demands on their business lines and on the consolidated firm.

### *Proposed Regulatory Reform*

Several amendments to Rule 2a-7 and related rules governing money market funds are being considered in the United States. These changes are designed to enhance the resilience of funds to withstand short-term market turbulence and to provide greater protection for investors. The amendments would require funds to maintain a portion of their portfolios in instruments that can be readily converted into cash, to reduce exposure to long-term debt, and to limit investments to the highest quality securities. The modifications under consideration would also permit funds that have “broken the buck” to suspend redemptions to allow for the orderly liquidation of fund assets.

## IV. SUPERVISORY EVALUATION OF SELF-ASSESSMENTS AND CRITICAL AREAS FOR CONTINUED FIRM IMPROVEMENTS

### A. Background on Self-Assessment Exercise

- **Twenty firms were asked to benchmark their practices to industry standards.**

In November 2008, supervisors asked twenty major global financial firms to conduct self-assessments of their current risk management practices. Supervisors asked firms to benchmark their practices against the recommendations and observations of five industry and supervisory studies published in 2008.<sup>16</sup> Taken together, these studies identified a wide range of 1) risk management control weaknesses that contributed considerably to reducing firms' financial resilience during the ongoing financial crisis and 2) risk management practices believed to have enhanced firms' abilities to withstand future market turbulence.

As instructed, the firms completed the self-assessments, presented the findings to their boards of directors, and submitted the self-assessments to their primary supervisors during the first quarter of 2009.<sup>17</sup> Supervisors reviewed, aggregated, analyzed, and discussed the results. Senior Supervisors Group member agencies subsequently participated in interviews to discuss the lessons that firms learned from the crisis and the changes made to their risk management practices since the issuance of the first SSG report in March 2008. Notably, and commendably, a few firms had already conducted self-assessments against several of these industry reports prior to the supervisory request.

The observations in this report represent the collective view of the SSG. This collective view is based on the SSG's evaluation of the self-assessment submissions, bilateral supervisory discussions with the firms, and fifteen collective supervisory interviews conducted with a sample of the firms that completed the self-assessments.<sup>18</sup>

<sup>16</sup> See footnote 1 for a list of the studies.

<sup>17</sup> The SSG compiled the recommendations and observations of these reports in a suggested template. The recommendations and observations were organized by theme and clustered according to subthemes to create thirty-two assessment topics. For each assessment topic, firms were asked to review the list of recommendations and observations and indicate if the firm's practices were fully, partially, or not aligned with them. A copy of the template is included in the supplement to this report.

### B. Overview of Results

- **Firms overall consider themselves well aligned with recommendations and observations, although to varying degrees across the set.**
- **Supervisors see more extensive gaps that still need to be closed.**

Supervisors found that many of the firms submitted thoughtful and substantive responses to the self-assessment exercise, but supervisors did not always agree with the firms' conclusions. Participating firms in aggregate were considerably more favorable in assessing their alignment with recommendations and observations than were their supervisors. Some of the differences arose because firms were giving themselves full credit for enhancements planned or only partially completed. While supervisors acknowledge some progress over the last twelve months since the crisis began, they see a clear need for broad-scale further remediation and believe that firms have to take significant additional action to institutionalize the recent changes that have been made. Supervisory views were generally more critical than those of the firms on the current state of board and senior management oversight, articulation of risk appetite, incentives, controls, and IT infrastructure. These issues are discussed in detail below.

#### 1. Practices Assessed by Firms as Most Aligned with Recommendations

Firms rated their practices regarding governance and certain aspects of liquidity monitoring and planning as those that were most aligned with recommendations (Table 1). Notably, firms determined that they have made the most progress on governance and liquidity topics. These areas may have received the most attention because of the leading roles they played in earlier events. Many of the changes cited by firms represent "low-hanging fruit" that could be made quickly without substantial investments in new infrastructure.

<sup>18</sup> It is important to note that the observations reported here are based on the firms' submissions. The supervisors did not validate these submissions and, at times, had views that differed from an individual firm's assertions. Some firms may have held themselves to a higher or lower standard than their peers in assessing the state of their controls. Nevertheless, the SSG members believe that, in aggregate, the relative order of alignment of firm practices with specific topics that emerged from the self-assessment exercise was broadly representative of the state of industry practice.



TABLE 1

**Assessment Topics with Which Firms Consider Themselves Most Aligned\***

Assessment Topic	Number of Firms			
	Fully Aligned	Partially Aligned	Not Aligned	NA/NR
Governance: Roles and responsibilities	20	0	0	0
Governance: Policies	20	0	0	0
Governance: Internal coordination and communication	20	0	0	0
Governance: Risk committee	19	1	0	0
Disclosure and transparency: Risk disclosure and transparency	16	3	0	1
Governance: Role of the chief risk officer	16	2	0	2
Liquidity risk: Monitoring and planning	18	2	0	0
Liquidity risk: Funding and reserve management	17	3	0	0

\*Firms assessed their risk management practices as being fully aligned with (assigned a “3”), partially aligned with (“2”), not aligned with (“1”), or not applicable to (NA) the individual recommendations and observations underlying each assessment topic. NR indicates no response. Firms’ overall alignment with each assessment topic is based on an average of their alignment with the individual recommendations and observations. In total, the self-assessment template included 188 recommendations and observations and 32 assessment topics.

TABLE 2

**Assessment Topics with Which Firms Consider Themselves Least Aligned\***

Assessment Topic	Number of Firms			
	Fully Aligned	Partially Aligned	Not Aligned	NA/NR
Identification and measurement: Monitoring	6	12	1	1
Liquidity risk: Transfer pricing	7	13	0	0
Counterparty risk: Risk monitoring and mitigation	9	11	0	0
Counterparty risk: Close-out practices	7	13	0	0
Identification and measurement: Concentration risk	7	13	0	0
Stress testing: Scope of scenarios	7	13	0	0
Identification and measurement: New products	7	11	1	1
Stress testing: Governance	10	9	0	1

\*Firms assessed their risk management practices as being fully aligned with (assigned a “3”), partially aligned with (“2”), not aligned with (“1”), or not applicable to (NA) the individual recommendations and observations underlying each assessment topic. NR indicates no response. Firms’ overall alignment with each assessment topic is based on an average of their alignment with the individual recommendations and observations. In total, the self-assessment template included 188 recommendations and observations and 32 assessment topics.

## 2. Practices Assessed by Firms as Least Aligned with Recommendations

Firms rated their practices associated with identification and measurement of risk, transfer pricing, counterparty monitoring, and stress testing as those that were least aligned with recommendations (Table 2). The supervisors agree with this assessment. Supervisors, however, view the challenges

associated with closing the gaps as more critical and difficult than do the firms, in aggregate, and note that resolution of each of these areas will likely require substantial investments in technological infrastructure. Failure to address these weaknesses will potentially undermine the effectiveness of practices viewed as aligned with the recommendations.

### C. Areas for Continued Improvement

Ten critical areas of needed improvement that are broadly relevant across firms emerged from the self-assessment results and interviews. Supervisors believe that considerable work remains in these areas, encompassing governance, incentives, internal controls, and infrastructure. The absence of action in some critical areas, such as the alignment of incentives and infrastructure-related matters, should raise questions for boards of directors, senior managers, and supervisors about the effectiveness and sustainability of recent changes. Supervisors will critically evaluate the progress on these and other issues.

Firms have reported progress in their alignment with some industry standards related to areas explored below, such as those associated with corporate governance and with liquidity planning and monitoring. The SSG believes that some of the noted adjustments, such as modifications of reporting lines or expanded metrics in liquidity reports, may represent less time- and resource-intensive actions, or “low-hanging fruit.” Such changes must be ingrained in firm culture and must be validated by boards, senior management, auditors, and supervisors as to their effectiveness in bringing about desired results.

In key areas explored, supervisors remain unconvinced that firms are undertaking the full scope and depth of needed improvements, irrespective of the self-assessment results. Further, if left unaddressed, certain gaps could potentially undermine the effectiveness of progress already made. For example, the postponement of needed IT infrastructure investment may limit firms’ ability to bring about meaningful change in liquidity planning and monitoring, including the timeliness and comprehensiveness of MIS reports, and firms’ ability to develop a centralized, aggregated view of their liquidity needs. More broadly, weaknesses in risk capture and misaligned incentives have the potential to limit the effectiveness of oversight and controls, particularly those associated with recent enhancements to practices.

Closing some of the acknowledged gaps, particularly those associated with infrastructure, is a resource- and time-intensive process. Continued oversight by supervisors and concerted discipline and commitment by firms will be required to undertake the needed investments and adjustments to practices.

Some of the highlighted areas of greatest need, such as board and management oversight, articulation of risk appetite, and compensation practices, are potentially a result of the aforementioned imbalance between the stature and resources allocated to firms’ revenue-generating businesses and those afforded to the reporting and control functions. Other areas, such as risk aggregation and concentration identification,

stress testing, and credit and counterparty risk management, can also be attributed to the weak condition of many firms’ IT infrastructure. While considered central to sound firm governance and risk management, the areas of continued improvement addressed here are not exhaustive. Firms and supervisors have identified a broad range of remediation needs in addition to these areas, many of which are addressed in the SSG’s first report. Additionally, the relevance and priority of improvement needs noted below may differ across institutions.

#### 1. Board Direction and Senior Management Oversight

- **Firms are generally undertaking adjustments to increase board and executive engagement and to strengthen the resources, stature, and authority of risk management; however, it is not yet clear whether these changes have contributed to stronger governance.**

Although firms reported that they had been operating for some time with a relatively high level of alignment with existing industry and supervisory expectations on governance, many have recently undertaken significant changes related to:

- increasing board and senior management engagement in risk management;
- improving risk reporting to the board and senior management;
- strengthening committee charters and the role of auditors and risk managers, including the chief risk officer’s membership on management committees; and
- incorporating finance into the risk management processes.

Many changes that firms have undertaken are organizational and appear to have been relatively easy to implement. Less clear is whether these organizational changes will—without further effort—improve future governance practices.

While firms reported alignment with recommendations on the need for boards of directors to have technical expertise sufficient to understand risk management issues, the assessments provided little supporting information. Only a few firms offered clear evidence of improvements in their board members’ financial or more specific banking business expertise, primarily noting recent appointments of new board members with such relevant knowledge. Several firms also discussed recent efforts to train board members to better understand complex risks through orientation, seminars,

individual tutorials, modules, or the engagement of third parties.

Firms said they grappled with increased expectations for boards of directors. Several firms acknowledged that the increased accountability and expectations of board members are inconsistent with the historical depth of their interaction with the firm. Because of the greater demands on people assuming this role, some firms are concerned that knowledgeable and competent executives may be deterred from becoming board members. Several firms also suggested that the expanded expectations of board members appear increasingly to overlap with responsibilities assigned to firm management.

Firms indicated that they are reviewing closely the processes by which chief executives, other senior officers, and the board of directors engage in risk management. Some firms are observing increased rigor and sophistication in the dialogue taking place at senior levels about risk management practices.

Virtually all firms have strengthened their risk management functions. Having gained a better understanding of the costs of failure, boards of directors and senior managers have given their risk management functions greater resources, independence, authority, and influence.

Organizational changes have focused on strengthening the chief risk officer position, with the introduction of more independent reporting lines, greater stature and authority on management and other committees, and, at a number of firms, direct involvement in business line compensation decisions. At most firms, risk management personnel assigned to business lines now formally report to the firm's chief risk officer and, in many cases, retain a weaker, "dotted-line" reporting responsibility with the business line executive. A few outlier firms, however, have yet to sever the joint reporting lines of risk management personnel to both the business line and the independent risk management function.

## 2. Articulating Risk Appetite

- **Supervisors see insufficient evidence of board involvement in setting and monitoring adherence to firms' risk appetite.**
- **Risk appetite statements are generally not sufficiently robust; such statements rarely reflect a suitably wide range of measures and lack actionable elements that clearly articulate firms' intended responses to losses of capital and breaches in limits.**

Most firms acknowledged some need for improvement in their procedures for setting and monitoring risk appetite. While

boards of directors reportedly approve risk appetites and strategies as articulated by management, most firms did not present much evidence of active board involvement in overseeing the setting or monitoring of the company's risk appetite or of board understanding of the firm's current risk position relative to its risk appetite. In several cases, firms admitted a disparity between the risks that the firm took and those that the board perceived it to be taking. Many firms indicated that they are in the process of revamping the way information is presented to their boards.

Firms said they were expanding the range of metrics for measuring risk appetite. Several firms that had previously calibrated limits to capital metrics were now focusing more on the level of quarterly earnings. Conversely, other firms were now paying more attention to "tail risks." These additional areas of focus, as well as the intense market interest in financial institutions' risk profiles since the onset of the crisis, underscore the need for firms to apply multiple measures of risk appetite, to develop a range of perspectives, and to consider a broad distribution of possible outcomes. These changes also suggest a need for firms to consider further what management actions are realistically feasible for restoring capital or reducing risk in adverse environments.

Many firms acknowledged that a conditional value-at-risk measure, using historical volatilities and correlations over a short period, does not generate the extreme outcomes necessary for the estimation and allocation of capital. Most firms are reviewing their use of economic capital risk measurement models in the wake of the crisis as well as expanding their use of these models. At least one firm said it has increased its internal charges on trading assets relative to the same position held on the banking book.

Supervisors view board direction as critical to sustaining a disciplined risk appetite for the firm when faced with market demands for increased risk taking. While the industry has not settled on a common way of expressing risk appetite, supervisors do see particular opportunities for needed improvement, which firms have undertaken to varying degrees:

- firms rarely compile for their boards and senior management relevant measures of risk (for example, based on economic capital or stress tests), a view of how risk levels compare with limits, the level of capital that the firm would need to maintain after sustaining a loss of the magnitude of the risk measure, and the actions that management could take to restore capital after sustaining a loss;

- few boards are willing to address risk appetite in a manner that not only clearly articulates individual risk limits but expresses the sum total of these limits as an overall risk appetite for the firm;
- firms' risk appetite statements often lack actionable elements that reflect their intended response to a range of possible events, such as a loss of capital or a breach of limits;
- few firms present their boards with a dynamic, or "flow," view of the capital account that details the sources of capital generation as well as the proposed uses of capital.

### 3. Compensation Practices

- **Most firms recognize that past compensation practices were driven by the need to attract and retain staff and were often not integrated within firms' control environments.**
- **Firms note the need to align better compensation with the risk appetite and are considering initial steps in this direction.**
- **Supervisors are concerned about the durability of proposed changes.**

Most firms recognized the need to improve incentive and compensation policies. Many indicated in self-assessments and subsequent interviews that they were working toward that goal. For example, one firm determined that there was a lack of corporate oversight of compensation plans. Upon review, the firm found that it had more than 150 different plans, and set a goal of substantially reducing this number. This firm's risk management function reviewed all of its compensation programs and found that incentives were in some cases misaligned, with no adequate deferral or claw-back arrangements. (The claw-back is an explicit statement by management that some portion of deferred compensation granted may be withdrawn prior to vesting, at the discretion of management.)

Firms undertaking these changes suggested that the incentives created by industry compensation practices were key contributors to the failure to ensure that the risk taken was properly controlled. In addition, they said compensation practices were inconsistent with the earning power and capital of the business and that competition to retain people led to some of this inconsistency.

Other firms, particularly a few that have fared comparatively well over the last two years, remained relatively comfortable with their compensation practices and saw little

need for change. These firms cited industry competition for talent as an obstacle to change. They believed that modifying compensation practices to be more conservative would lead to competitive disadvantages.

All firms, however, felt that compensation incentives needed to be reconsidered as part of the firm's control framework. Firms appeared to be exploring changes to all components of their compensation regimes: the accrual of bonus pools, allocation of pools to business units and individuals, and the form of compensation paid out, with a goal of better aligning practices with control objectives. Some frequently noted issues were:

- Historical compensation arrangements were generally not sensitive to risk and skewed incentives to maximize revenues. Firms generally acknowledged, and supervisors agreed, that compensation practices have been insensitive to the levels of risk taken to generate income and to costs associated with the long-term commitment of funds required to hold illiquid assets. Firms largely acknowledged that current compensation practices, or those in place prior to the crisis, created strong incentives to maximize revenues rather than risk-, capital-, and liquidity-adjusted earnings.
- Accrual of compensation pools historically did not reflect all appropriate costs. In many cases, industry practice previously defined the pool of funds available for distribution as incentive compensation in any year to be a simple percentage accrual of net revenues, excluding many expenses and the costs of liquidity and capital. Several firms indicated that aggregate incentive compensation pools will no longer represent a simple accrual of top-line revenues but instead will be a function of the bottom-line return on risk the firm achieves. Others indicated that they would now base the aggregate pool on profit and use net income, rather than net revenue, for accruals.
- Individual performance measurement schemes have often not reflected true economic profits, adjusted for known costs and uncertainty. At many firms, performance measurement schemes used to distribute the bonus pool did not incorporate the costs of the capital and liquidity employed in the generation of revenue. Moreover, revenues contributing to performance measurement schemes were often specifically constructed by management and, in some cases, excluded material risks to the firm. In other cases, future potential revenues whose realization

remained highly uncertain were incorporated into current-year performance income.

As a result, firms are considering changes to their practices:

- Recognizing these weaknesses, most firms that had not integrated performance measurement schemes with the costs of liquidity and capital were now implementing these practices. Firms said they were developing the transfer pricing mechanisms to ensure that internal performance measurement schemes included both the cost of capital employed in the generation of revenues and the cost of funds consistent with the liquidity of the positions funded. Liquidity surcharges based on the characteristics of positions funded were to be added to the transfer-priced cost of funds.
- Some firms found that performance evaluations lacked the input of control functions, a practice that the firms are now looking to change. The chief risk officer is now involved directly in business-line compensation decisions at a number of firms. Additionally, certain firms are now engaging risk or compliance personnel in compensation decisions at the sub-business level.
- Deferred compensation plans are being reviewed by firms with an eye toward longer vesting and distribution periods, although views on the effectiveness of deferred compensation measures varied. Some firms were exploring extending the length of the deferral beyond the conventional two-to-three-year period. One firm stated that executive compensation should have a deferral component that mimics the tail risk assumed by the firm. However, some firms felt that the deferred vesting and delivery of some portion of compensation in the form of restricted stock or stock options has had little impact on individual bankers and traders beyond motivating retention.
- Several firms have attempted to align compensation with longer term performance by implementing a claw-back provision in deferred compensation as a standard part of their compensation practices. Where claw-back provisions existed in the past, they were typically very limited, that is, to cases of material misstatement or illegal activities. Firms considering expanded use of claw-backs are working to develop standards for when a claw-back may be invoked.

#### 4. Information Technology Infrastructure

- **The importance of a resilient IT environment with sufficient processing capacity in periods of stress is becoming increasingly evident.**

- **Firms are constrained in their ability to effectively aggregate and monitor exposures across counterparties, businesses, risk strands, and other dimensions because of ineffective information technology and supporting infrastructure.**

Many firms, in their self-assessment submissions and in subsequent discussions, said they are making considerable investments in risk management infrastructure. Many projects, however, are in the planning stages or in the infancy of execution, with significant work remaining.

One challenge to improving risk management systems has been poor integration resulting from multiple mergers and acquisitions. One firm suggested that acquisitions over the years have produced an environment in which static data are largely disaggregated. Another firm echoed this view, reporting that certain products and lines of business have not been included in data aggregation and analysis processes. A third firm reported that having two systems for the same business results in duplication of processes.

Another critical infrastructure concern during recent market events was the ability of firms to process record-high volumes of product transactions during periods of market stress. Transactions in equities, foreign exchange, government securities, and other instruments spiked sharply during the market disruption, taxing some firms' systems. Proactive firms are responding to this challenge by adding capacity to key system platforms to ensure that they can process volumes well in excess of previous peak levels.

#### 5. Risk Aggregation and Concentration Identification

- **Self-assessment responses suggest that identification of risk concentrations is an area of weakness; firms are looking to automate identification of concentrations by counterparty, product, geography, and other classes.**

Data aggregation remained a central issue limiting firms' risk management capabilities, most notably in the management of CCR. Many firms lacked the ability to aggregate exposures, particularly gross and net exposures to institutional counterparties, in a matter of hours. This challenge includes the aggregation of exposures at the legal entity level. A number of firms also experienced difficulties integrating credit and market risks at the enterprise level and evaluating the two jointly in a consistent manner. Fragmented infrastructure and an overreliance on manual data compilation were among the factors impairing firms' ability in this regard. In addition, firms noted "off-line" trades that were not captured

in the main exposure model, but that represented a disproportionately large percentage of their overall measured CCR exposure. Excluding these “add-ons” diminishes the reliability of aggregate measures.

One firm noted that it had the ability to aggregate data to a *single* large counterparty within a day; however, during some periods in fall 2008, information was needed on a dozen or more counterparties that were of concern. Two-thirds of firms indicated that they were only partially aligned with regard to the capacity to estimate asset class concentrations and institutional counterparty exposures within hours.

Two-thirds of firms responded that they were only partially aligned with the recommendations that credit risks be viewed in aggregate, that consideration be given to the effects of correlations between exposures, and that counterparty risk consider the size and direction of positions a counterparty has with other firms. Many firms cited large-scale IT projects planned or under way to address these infrastructure and aggregation deficiencies. In the past, many such projects have fallen behind schedule because of inadequate investment and resources. In the current environment, these projects will require a significant dedication of funds, sponsorship, and commitment from the board and senior management during challenging economic times to ensure that technology platforms are constructed to handle unexpected spikes in volumes and to effectively produce aggregated data and appropriate management information for credit, liquidity, market, and other risk metrics.

## 6. Stress Testing

- **Firms report enhancements to and increased use of stress testing to convey risk to senior management and boards, although significant gaps remain in their ability to conduct firm-wide tests; credibility of extreme scenarios, despite recent events, remains an issue for some firms.**

Firms reported that they have been developing and implementing more robust stress-testing regimes and are placing a greater reliance on these tools. In contrast to the past, firms now report significant management “buy-in” to enhancements. According to the self-assessment results, most firms made some improvement in the frequency, flexibility, and number of scenarios and risk types in their stress testing as well as increased their senior management’s involvement in stress-testing programs.

Nevertheless, interviews confirm that most respondents still do not have regular, robust, firm-wide stress tests. Many

participants noted significant efforts under way to develop such tests. However, much of the progress to date appeared to be short-term and tactical in response to increased interest on the part of management and requests from firms’ boards to conduct specific scenarios, as opposed to progress that is strategic and forward-looking.

While more firms now perform stress tests based on hypothetical scenarios, many others still do not have the necessary infrastructure to allow them to develop easily and consider forward-looking scenarios, representing a significant weakness for the industry as a whole. Even when forward-looking stress tests are conducted, the process is resource-intensive, owing to infrastructure limitations. Reverse stress testing, a forward-looking approach advocated in CRMPGIII (p. 84),<sup>19</sup> was reported to still be in its infancy; only two firms indicated that they run a reverse stress test designed to identify scenarios or risk factors that can cause a significant stress event for the firm or business line.

Firms repeatedly cited credibility as the primary criterion for stress and scenario analysis to influence management behavior, even after the events of September-October 2008. For this reason, the most common stress tests conducted have generally been those subjecting trading or credit accounts to extreme historic events. Still, some firms are relying increasingly on research and economic teams to forecast events that risk teams can then simulate.

## 7. Counterparty Risk Management

- **Flexibility in some firms’ CCR management systems proved particularly valuable; in contrast, the inability of other firms’ CCR systems to identify directional risk drivers limited these institutions’ responsiveness to sharp changes in exposures.**

The range of significant counterparty concerns during the financial crisis illustrates the value of flexible risk systems that permit firms to “drill down” and understand how their exposures would react as market conditions change. The flexibility and drill-down capabilities of models and systems facilitate a nuanced understanding of specific risk drivers within particular exposures. In addition to risk monitoring, these capabilities enable firms to more effectively determine desired changes to their hedging in response to changes in risk exposure. Of note, firms that had well-developed systems in place were able to hedge or flatten risk proactively and were able to react quickly to sharp changes in exposures.

<sup>19</sup> See <<http://www.crmpolicygroup.org/docs/CRMPG-III.pdf>>.

Firms still focus on current and potential exposure as the primary measures of CCR but, because of the crisis, they have been investing more heavily in counterparty stress-testing capabilities. The integration of stress testing as a meaningful concentration management tool will continue to be a focus going forward. In addition, some firms are developing other measures of risk to complement potential exposure measures and stress testing, but these efforts are still nascent and in some cases informal. Many firms recognize that potential exposure and stress-testing measures are not designed to capture all forms of counterparty credit risk. In response, they place value on utilizing additional risk analysis, such as crowded trade analysis, wrong-way risk identification, jump-to-default loss estimations, and credit valuation adjustment sensitivities.

### **8. Valuation Practices and Loss Recognition**

- **The loss of confidence among creditors, counterparties, and clients in firms' valuation practices for certain assets during the crisis contributed directly to the withdrawal of funding and other liquidity drains on firms in varying forms.**
- **Many firms are reviewing the oversight of their valuation function and working to increase the rigor of processes associated with, for example, enforcing uniform pricing across the firm, valuing models, and escalating valuation disputes; nonetheless, substantial work remains for firms to adhere to industry standards for valuation practices.**

From a risk management and governance perspective, the finance department plays an essential corporate control role in underpinning the effectiveness of valuation practices and robust loss recognition. Several firms expressed agreement that the finance department, and the areas responsible for carrying out key valuation processes, must be independent and maintain sufficient stature and influence in the firm. For example, several firms noted that if there is a difference in views between control and business personnel over a valuation in the absence of a clearly established, market-based price, escalation processes must be clear and the control function's view must ultimately prevail.

Based on the self-assessment results, most firms did have some mechanisms in place to enforce uniform pricing across legal entities and to decrease material valuation inconsistencies, yet some firms were uncertain that the same instrument held by different business units was marked at

the same price. Multiple systems and valuation models with differing pricing sources for the same product set were obstacles to achieving consistency, according to firms.

Some firms cited issues in ensuring that price-sensitivity analysis was performed consistently and formally across all financial instruments. Several firms acknowledged that they did not devote sufficient analytical resources to checking valuations and making adjustments during periods of low liquidity and to establishing a specialized financial control staff to perform fundamental analysis of underlying positions and to enforce discipline internally in marking their assets to their established prices.

One firm has increased the rigor of its profit-and-loss explanation process. Risk management must now explain the profit and loss to senior management, complementing the traditional controller's explanation. This firm stated that risk managers have a different perspective than that of controllers and can better tie profit and loss to risk positions.

Based on the interviews, firms gained a new appreciation for the importance of timely recognition of losses. A lesson learned by some firms was to maintain and adhere as much as possible to asset disposal schedules, even if at less desirable prices, in order to reduce the likelihood of much larger losses.

### **9. Operations and Market Infrastructure**

- **Firms are making substantial progress standardizing practices, reducing backlogs of unconfirmed OTC derivatives positions, and improving collateral management techniques.**
- **Notwithstanding the significant efforts by firms to mitigate risk, work remains to improve key personnel's detailed knowledge of financial market utilities and communication with settlement infrastructure providers.**

Many firms expressed a better appreciation for the operations and risk-reduction benefits provided by the financial market utilities. In light of the importance of payment and settlement, chief risk officers and other key decision-makers were working to refresh their knowledge of utilities such that, when institutions are informed of time-sensitive issues, they have a baseline understanding of the systems in question. A few firms stated that front-office and risk management personnel lacked sufficiently detailed knowledge of the processes of financial market utilities and that the firms were working to establish awareness at the staff

and senior executive levels. Overall, firms cited the importance of effective communication between firms and settlement infrastructure providers.

In OTC derivatives, firms reported progress streamlining business processes toward the goal of same-day matching, adoption, and implementation of standard technology platforms as well as improving collateral management practices and reducing notional amounts of outstanding CDS transactions through portfolio compression.

On a positive note, as the SSG has previously reported, the processes around the resolution of Lehman's OTC derivatives book were far less disruptive than regulators and market participants had feared. Substantial industry efforts to standardize practices and reduce backlogs of unconfirmed positions appear to have significantly mitigated a substantial risk. Out of the approximately 900,000 Lehman OTC derivatives transactions, only a very few have been disputed to date, an indication that efforts to reduce unconfirmed trades have had a positive impact.

## 10. Liquidity Risk Management

- **As a result of lessons from the crisis, firms are making meaningful progress improving funding and liquidity risk management practices, but supervisors and some firms acknowledge that substantial work remains to align fully with industry standards.**

Almost all firms have sought to strengthen structures and processes to enhance firm-wide governance of liquidity. Firms have taken steps to improve the structure of their

treasury, liquidity risk management, and related functions, and to enhance liquidity reporting and other forms of communication for the entire firm. Funds transfer pricing processes and many aspects of contingency planning are being enhanced. It is important to note that no firm's contingency plan proved fully effective during the crisis. Among a range of issues, firms found that stress scenarios should overlay firm-specific shocks with systemic shocks. Firms also learned that complex corporate structures, by constraining the flow of funds between legal entities, hindered their ability to effectively manage firm-wide funding needs during the crisis. Section III provides an elaborate discussion of firms' reported enhancements to funding and liquidity risk management practices as a result of lessons from the crisis.

Some of the changes that firms have made are among the more easily achievable enhancements, such as organizational efforts to improve the coordination and interaction between the treasury function, the risk management function, and the business lines. The extent to which such changes are formalized into policies and procedures—and more important, ingrained into the corporate culture—will determine their sustainability and effectiveness. Other structural changes—such as improvements to firms' liquidity reports, collateral management practices, and funds transfer pricing—are more resource- and time-intensive. Concerted discipline and commitment on the part of boards of directors, senior management, and supervisors will be required to undertake the IT infrastructure investments needed to support these changes and to continue to improve the robustness of these liquidity risk management systems.



## Appendix A

**Self-Assessment: Firms' Reported Degree of Alignment with Recommendations and Observations of Industry and Supervisory Studies\***

Assessment Topic	Number of Firms			
	Fully Aligned	Partially Aligned	Not Aligned	NA/NR
<b>Governance</b>				
Policies	20	0	0	0
Roles and responsibilities	20	0	0	0
Internal coordination and communication	20	0	0	0
Risk committee	19	1	0	0
Risk appetite	13	7	0	0
Incentives and compensation	14	4	0	2
Role of the chief risk officer	16	2	0	2
Resources	17	3	0	0
<b>Identification and measurement</b>				
Scope and procedures	10	10	0	0
Metrics	13	7	0	0
Monitoring	6	12	1	1
New products	7	11	1	1
Concentration risk	7	13	0	0
<b>Counterparty risk</b>				
Close-out practices	7	13	0	0
Risk monitoring and mitigation	9	11	0	0
<b>Liquidity risk</b>				
Funding and reserve management	17	3	0	0
Monitoring and planning	18	2	0	0
Transfer pricing	7	13	0	0
<b>Market risk</b>				
Valuations: Oversight, accountability, policies, and procedures	17	2	0	1
Valuations: Metrics and analysis	13	6	0	1
Trading patterns	12	4	0	4
Market infrastructure	10	7	0	3
Origination standards	15	3	0	2
<b>Securitization and complex products</b>				
Appropriate investors	12	4	0	4
Documentation	9	6	0	5
Risk management	12	7	0	1
<b>Stress testing</b>				
Scope of scenarios	7	13	0	0
Governance	10	9	0	1
<b>Disclosure and transparency</b>				
Prospectus disclosure	8	4	0	8
Standardization and increased transparency	11	5	0	4
Risk disclosure and transparency	16	3	0	1
Valuations disclosure and transparency	12	4	1	3

\*Firms assessed their risk management practices as being fully aligned with (assigned a "3"), partially aligned with ("2"), not aligned with ("1"), or not applicable to (NA) the individual recommendations and observations underlying each assessment topic. NR indicates no response. Firms' overall alignment with each assessment topic is based on an average of their alignment with the individual recommendations and observations. In total, the self-assessment template included 188 recommendations and observations and 32 assessment topics. The results reported here are based on the firms' own assessments of their risk management practices. Some firms may have held themselves to a higher or lower standard than their peers in assessing the state of their controls.

Appendix B

**Members of the Senior Supervisors Group**

**CANADA**

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**SWITZERLAND**

*Financial Market Supervisory Authority*

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Marc R. Saidenberg

*Office of the Comptroller of the Currency*

Mike Brosnan  
Kathy E. Dick  
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Alexa Philo, Morgan Bushey, Brian Begalle, Jeanmarie Davis, Clinton Lively, and Jainaryan Sooklal, all of the Federal Reserve Bank of New York, and Kerri Corn of the Office of the Comptroller of the Currency

## Glossary

Term	Definition*
2a-7 funds	2a-7 money market funds are U.S. open-end management investment companies that are registered under the Investment Company Act and regulated under Rule 2a-7 under the Act. Unlike other investment companies, 2a-7 funds are able to use the amortized cost method of valuing their portfolio securities rather than mark-to-market valuation, which allows them to maintain a stable net asset value, typically U.S. \$1.00 per share.
Asset-backed commercial paper	A short-term investment that encompasses the use of a special purpose vehicle or conduit; the conduit serves as the commercial paper issuer. The commercial paper is backed by physical assets such as homes, automobiles, or other physical property.
Bid-back request	An investor's request to a borrower to unwind a transaction earlier than contractually agreed upon.
Break-the-buck	A condition that occurs when a money market fund determines to discontinue the use of the amortized cost method of valuing its portfolio securities and to reprice the fund's shares below \$1.00 per share.
Claw-back	A provision in a law or contract that limits or reverses a payment or distribution for specified reasons.
Commingled funds	In securities lending, commingled funds refer to a pooling of cash collateral from multiple beneficial owners/lenders that is then used to purchase securities.
Contingency funding plan	A comprehensive plan that financial institutions have in place to maintain sufficient liquidity resources in a contingency scenario. Contingency funding plans typically include cash flow projections that estimate funding needs under adverse conditions, and should present courses of action for addressing unexpected short-, medium-, and long-term liquidity needs.
Credit default swap	An agreement between two parties in which the seller provides protection to the buyer against nonpayment of unsecured corporate or sovereign debt. The "protected" party pays an initial or ongoing scheduled fee in exchange for a guarantee that, if a bond/loan goes into default, the protection seller will provide compensation.
Credit valuation adjustment	The mark-to-market estimate of the counterparty credit risk from a firm's derivatives exposures.
CUSIP number	A number identifying all stocks and registered bonds, assigned by the Committee on Uniform Securities Identification Procedures (CUSIP). Brokers use a security's CUSIP number to obtain further information on the security; the number is also listed on trade confirmation tickets. The CUSIP system makes it easier to settle and clear trades. Foreign securities use a similar identification system: the CUSIP International Numbering System, or CINS.
Daylight exposure	Credit extended for a period of less than one day. In a credit transfer system with end-of-day final settlement, daylight credit in effect is extended by a receiving institution if it accepts and acts on a payment order even though it will not receive final funds until the end of the business day.
Free credit balance	The cash held by a broker in a customer's margin account that can be withdrawn by the customer at any time without restriction. This balance is calculated as the total remaining money in a margin account after margin requirements, short-sale proceeds, and special miscellaneous accounts are taken into consideration.
Funds transfer pricing	An internal cost-accounting system or methodology that transfers a cost-of-funds expense to profit centers that generate assets requiring funding and a funds credit to profit centers that provide funding.
Haircut	The percentage by which an asset's fair market value is reduced for the purpose of calculating lendable value/borrowing capacity.
Interbank deposit	Any deposit held by one bank for another bank. In most cases, the bank for which the deposit is held is known as the correspondent bank. The interbank deposit arrangement requires both banks to hold a "due to account" for the other.
Net asset value	An investment company's total assets minus its total liabilities.

\*Based on publicly available and supervisory sources.

## Glossary (Continued)

Term	Definition*
Novation	An agreement to replace one party to a contract with a new one. The novation transfers rights as well as duties and requires the consent of both the original and new parties.
OTC derivatives market	The over-the-counter, or OTC, market where derivatives transactions are executed directly between two parties through a telephone or computer network, without use of an exchange. A derivative is a financial contract (usually a bilateral contract) whose value is derived from another asset, index, event, or condition.
Portfolio compression	A market-wide exercise to reduce the gross notional outstanding and trade population by eliminating offsetting trade positions within the same product types and across multiple counterparties. Portfolio compression thus reduces the counterparty credit exposure and operational risk attached to superfluous outstanding trade positions that offer no additional economic benefits. Currently, credit and interest rate derivatives have regular cycles for portfolio compression.
Prime brokerage	A service offered by securities firms to hedge funds and other professional investors. Prime brokerage may include execution/clearance of transactions, margin financing, centralized custody, securities lending, and other administrative services such as risk reporting. The growth of the hedge fund sector over the last decade was supported by concurrent growth in the prime brokerage business of the investment banks that service these funds.
Rehypothecation	A practice in which a prime broker can take control, and in some jurisdictions legal title, over a client's assets, subject to an obligation to return the same or economically similar assets at a future time. By taking legal title over the assets, the prime broker is free to utilize the assets as it sees fit, including the sale of such assets or the pledging of them as security for amounts borrowed from counterparties. In practice, rehypothecation rights are used by prime brokers to obtain secured funding to finance margin loans provided to clients; however, such rights also enable prime brokers to cross-fund other positions on a portfolio basis in certain circumstances. The secured funding obtained through rehypothecation rights enables a prime brokerage business to be largely self-financing, as loans to clients are funded through rehypothecation of client assets.
Repurchase agreement	An agreement between a seller and a buyer of securities in which the seller agrees to repurchase the securities at an agreed-upon price, usually at a stated time.
Reverse stress test	A stress test in which the starting point of the analysis is an assumption that over a short period of time, an institution incurs a very large, multi-billion-dollar loss. The analysis then works backward to identify how such a loss could occur given actual positions and exposures prevailing when the stress test was conducted. If the assumed loss were truly large, it is highly likely that the possible sequence of events producing the loss would entail elements of contagion or systemic forces. Thus, the reverse stress test is likely to require institutions to address issues that are not normally captured in stress tests.
Same-day matching	A process that occurs when parties to an OTC derivatives trade obtain legal confirmation of the transaction on the same day the trade is executed, also known as "T+0 matching" or "same-day confirmation." Same-day matching continues to be an operational efficiency goal for the post-trade processing of OTC derivatives.
Triparty repo	In a triparty repo model, a custodian bank helps to administer a repo (repurchase) agreement between two parties. An investor places its money with a custodian bank, which in turn lends it to another institution; assets are then pledged as collateral for the loan. The triparty agent is responsible for administration of the transaction, including collateral allocation, marking to market, and substitution of collateral. Both the lender and borrower of cash enter into these transactions to avoid the administrative burden of bilateral repos.
Upgrade trade	For less liquid securities financed on behalf of hedge fund clients, prime brokers may enter into upgrade trades. In such a trade, the less liquid securities are exchanged with certain stock lenders for more liquid securities that are then monetized by the prime broker through repurchase arrangements.
Value-at-risk	A measure of expected loss over a given time interval under normal market conditions at a specified confidence level.

\*Based on publicly available and supervisory sources.